THE CONFLICT-COEXISTENCE CONTINUUM: A HUMAN DIMENSION CASE STUDY ON WILD BOAR MANAGEMENT IN ITALY

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The Conflict-Coexistence Continuum:

A Human Dimension Case Study on Wild Boar Management in Italy

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Abstract

The expansion of human settlement into natural landscapes and the arrival of species into rural and urban areas have led to frequent human-wildlife interactions. Although such interactions can turn into positive or negative experiences for humans and wildlife, researchers have conventionally looked at the negative side, focusing on conflicts. This emphasis on conflict has represented a constraint to wildlife conservation; authorities have focused on reducing negative experiences, rather than on increasing positive interactions between humans and wildlife.

The overarching goal of this dissertation is to address this gap by better encompassing coexistence in conservation. Thus, this dissertation explores the concepts of conflict and coexistence as related events along a continuous line, with major conflicts positioned at one end, and the integration and acceptance of wildlife within the human landscape at the other. The conflict-coexistence continuum was developed using a framework that examines negative to positive feelings toward species in wildlife management and conservation. The specific objectives of this study investigate how the conflict-coexistence continuum and framework were shaped by: 1) the format of the scale used to explore this concept; 2) the location in which participants' live; and 3) the perceptions participants hold toward wildlife and its management. To investigate these three objectives and implement the framework, a case study using wild boar was completed in two protected areas of central Italy. Quantitative face-to-face interviews

were carried out about wild boar and wild boar management in Circeo National Park (n= 801) and the Regional Nature Reserve Nazzano-Tevere-Farfa (n= 452).

While the emphasis on conflict outlined in this dissertation is not original, the idea of integrating conflict and coexistence along a continuum as a way to achieve conservation is new. As demonstrated in this dissertation, conflict and coexistence are related concepts influenced by factors such as the location of participants, their perception of species, and their specific interactions with wildlife. It is shown that researchers and managers should not simply focus on addressing negative experiences between humans and wildlife. They should also be creative and innovative in using coexistence interactions to increase the public's willingness to tolerate wildlife in their proximity.

Keywords: human-wildlife interactions, conflict, coexistence, human dimension, wild boar management, protected areas, public involvement, Italy.

Dedication

To Raimondo and Alice, the joy of my life.

Acknowledgements

Many are the people to acknowledge for their participation, support, insights and comments received during my PhD.

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List of Abbreviations and Symbols

ARP- Regional Park Agency Lazio

HD- Human Dimensions

RNR- Regional Nature Reserve

VAS- Visual Analogue Scale

WWF- World Wildlife Fund for Nature

Glossary of Main Concepts

Attitudes are mental states that reflect people positive or negative evaluations of an object. Three components need to be evaluated to assess attitudes: 1) affective (i.e., feelings about the species), 2) cognitive (i.e., beliefs about the species) and 3) behavioural intention (i.e. belief of how a person will behave in a specific situation) (Decker et al., 2001).

The *conflict-coexistence continuum* is a new idea, developed in this manuscript, that explores conflict and coexistence as opposite ends of the same concept. By applying this idea of a continuum, the researcher aims to measure the negative to positive attitude toward a species using the same dimension.

Continuous rating scales are horizontal or vertical lines with or without descriptors underneath them. Individuals indicate their rating of an objective by recording their judgment anywhere along the response continuum (Christ and Boice, 2009).

Perceptions are complex constructions of simple elements joined through association. They are created by organizing and interpreting sensations trough a process of becoming aware, understanding, and learning about the environment that surrounds us (Pomerantz, 2003).

Itemized rating scales are composed of multiple categorical answers, described by behaviours. Individuals indicate their rating of an objective by selecting the answer that

best describes their opinion among a limited number of categories (Christ and Boice, 2009).

Integrated wildlife management is applied when different management strategies, such as preventive methods, compensation, and selective killing of wildlife, among others, are carried out concurrently (Monaco et al. 2010).

Human-wildlife conflicts are shaped by negative interactions or clashes in needs between people and wild species. The word *conflict* is associated with negative human experiences with, and perceptions toward, wildlife in this manuscript.

Human-wildlife coexistence arises from positive human-wildlife interactions or human tolerance toward wild species. In this manscript, the word *coexistence* is associated with positive experiences and perceptions, as well as the support and tolerance of human toward wildlife.

Values are long-lasting beliefs or mental constructs that reflect our fundamental desires or determine our behaviour, depending on what is important to us, such as morality, ethics, or family (Fulton et al., 1996; Decker et al., 2001).

List of Appendices

Co-authorship Statement

The design and identification of the research proposal, the practical aspects of the research, data collection and analysis, and the manuscript preparation has been carried out by the author of this dissertation. Co-authors have contributed to all stages of this process by critically reading and giving feedback to implement the dissertation.

In all papers reported in this dissertation, the candidate was the first and corresponding author that identified the research proposal, performed all data collection and analysis, and wrote the articles. The co-authors contributed to these articles by helping in data interpretation and by reviewing the papers.

The first paper "The conflict-coexistence continuum: a comparison between Likert-type scale and Visual Analogue Scale" was a collaborative effort with Dr. Jenny A. Glikman. An extract of this paper has been submitted to the journal Public Opinion Quarterly.

The third article "Wildlife management: a tool to foster coexistence or to increase conflict between humans and wildlife?" was a collaborative effort with Andrea Monaco and has been submitted to the European Journal of Wildlife Research.

1. Overview of the dissertation

All over the world, human-wildlife interactions have increased in and around protected areas due to the lack of physical separation between people and wildlife (Woodroffe et al., 2005). Protected areas have been established within and around existing human settlements, and the land set aside for nature conservation has long included human uses (such as agriculture and livestock farming) (Woodroffe, 2000; Choudhury, 2004; Jankins and Keal, 2004; Woodroffe et al., 2005). Daily encounters between animals and people have often resulted in conflicts, creating the need for integrated wildlife management strategies and proactive public involvement in wildlife decision-making processes (Riley et al., 2002, Woodroffe et al., 2005).

A good example of this situation is found in Italy, where protected areas and their buffer zones are made up of highly fragmented and heterogeneous territories enclosing several thousand residents, human-shaped environments, mosaics of natural habitats, and growing populations of wildlife. The establishment of protected areas for biodiversity conservation in Italy has led to an increase in the number and home range of wild boars (*Sus scrofa*) throughout the country (Carnevali et al., 2009; Monaco et al., 2010), making the country ideal for exploring human-wildlife interactions. Rising wild boar impacts, such as crop damage and animal-vehicle collisions, as well as the importance of this species for hunters, have incited controversy about how to best manage wild boar (Apollonio et al., 1988; Schley and Roper, 2003; Monaco, et al., 2003; Carnevali et al., 2009; Monaco et al, 2010). A number of specific issues have arisen about culling the

species or capturing and relocating wild boar outside protected areas, among others. The high level of conflict over wild boar management experienced in Italy, and especially within the Lazio region, has set the stage for a four-year (2007 to 2011) human dimension (HD) decision-making project between the Lazio Regional Park Agency (ARP) and Memorial University of Newfoundland (Canada). Of the 143 protected areas present in Lazio region, two, Circeo National Park and the Regional Nature Reserve (RNR) Nazzano-Tevere-Farfa, were selected as the case studies for the HD project.

A doctoral research plan was developed as part of the broader HD project to meet both the needs of the ARP management agency and the goals of academic research. For both dimensions of this project, the perceptions, beliefs, attitudes, and behaviours of the public were explored to better understand the complex issues facing human-wild boar interactions in and around protected areas. As the expansion of wild boar outside protected areas has led to rising controversies over its management in Lazio, the overarching goal of this dissertation is to explore how human-wildlife interactions turn into situations of conflict or coexistence between people and other species. The challenge is to determine how negative attitudes toward (or conflict situations with) wildlife can be minimized enough that coexistence (or positive perceptions) occurs, so that people begin to tolerate sharing the same environment with wildlife. By understanding values associated with wild boar, identifying conflicts, and working with the public toward solutions, managers can develop supported wild boar management plans (Monaco et al., 2010). Engaging those who are affected by wildlife management decisions represents the

first step towards conflict resolution, and might represent a tool to increase tolerance between humans and wildlife (Decker et al., 2001; Madden, 2004a; Mannigel, 2008).

Interactions between humans and wild animals are often explored primarily as conflict experiences (Messmer, 2000; Madden, 2004a; Woodroffe et al., 2005; Messmer, 2009). However, human-wildlife relationships are not only about situations of conflict; they are also about coexistence. Integrating coexistence, while examining conflict, is therefore developed in this research as a way to achieve conservation. Rarely have studies focused on coexistence (see Peterson et al., 2010 for review) or investigated opinions about a species and its management as a basis for understanding the factors that influence people's willingness to tolerate wild species in their proximity. By examining both conflict and coexistence, this dissertation illustrates how these concepts can be plotted along a continuum sensitive to values, culture, and geographical locations.

To develop the conflict-coexistence continuum concept, an interface between socio-cultural factors, protected areas, and wild boar management is created from an HD perspective. The thesis involves the following steps: (1) exploring human-wildlife interactions in a general introduction; (2) reviewing the HD field; (3) designing research hypotheses and objectives that focus on a conflict-coexistence continuum framework; (4) carrying out three research papers; and (5) discussing the outcomes of this research in a conclusion and further implications section. In this dissertation, the cultural and spatial dimensions of human-wildlife conflict and coexistence within HD are integrated with the human-environment tradition of geography (Pattison, 1964), anthropology, and conservation biology to develop the conflict-coexistence continuum framework (Knight,

2000; Mullin, 2002; Groom et al., 2006). The relationship between human and non-human, the perception of animals "in place" or "out of place," and the socio-cultural contextualization of humans "in" or "out" of nature are all topics which have played and continue to play a fundamental role in these academic fields (Lynn, 1998; Wolch and Emel, 1998; Philo and Wilbert, 2000; Knight, 2000; Groom et al., 2006).

In the first article, "The conflict-coexistence continuum: a comparison between Likert-type scale and Visual Analogue Scale", the conflict-coexistence continuum framework is considered by investigating the refinement of two scales with different discrimination power, while assessing human feelings toward wildlife. Two wild boar case studies are used to explore which format would best characterize people's conflict and coexistence perceptions along a continuum in Circeo National Park and RNR Nazzano-Tevere-Farfa. Never before within the HD field have scales been explored to understand which question design better enables the measurement of people's positive to negative feelings towards wildlife. This comparison between scales not only introduces a new questionnaire format in HD, it further assesses how different rating scales can be used in social-science disciplines. By further investigating item wording and design, researchers will be able to develop questions that best represent human thought toward specific research topics. This will help demonstrate whether a sample population leans toward the conflict side or the coexistence side of the balance. The paper is formatted to be compatible with the requirements of the journal *Educational and Psychological Measurement.*

The second paper of this dissertation, "Conflict and coexistence in protected areas borderlands: a wild boar case study in Italy," addresses the issues of conflict and coexistence along a continuum for the first time. The paper is formatted to be compatible with the requirements of the journal *Society & Natural Resources*. Conservation strategies have traditionally focused on whether people and wildlife are either inside or outside the boundary of protected areas (Grant and Quinn, 2007). Often, protected areas are not different or separate from their surrounding human-modified landscapes. Rather, they are enclosed in social contexts and shaped by social interactions (Westet al., 2006; West and Brockington, 2006). Thus, public attitudes toward wild boar and wild boar management options in and around Circeo National Park are explored to understand how the location in which participants live (i.e., inside or outside the protected area) generates negative to positive public perceptions toward wild boar. Such an understanding offers the opportunity to better define human-wildlife interactions and implement the conflict-coexistence continuum framework designed for this dissertation. Furthermore, by integrating conservation biology themes (e.g., protected areas) and social science topics (e.g., animal-human dichotomy and boundary) in an innovative way, researchers and managers are better able to include the public in decision-making processes, and thus increase the success of wildlife management and conservation projects.

Since different interest groups may hold different views on what should be done to effectively manage wildlife (Kellert, 2000; Mech, 2001), attitudes toward wild boar management options are explored among the general public, hunters, commercial farmers, and subsistence farmers in RNR Nazzano-Tevere-Farfa. By understanding the

issues concerning wild boar in and around protected areas, managers can apply part of the conflict-coexistence continuum framework in the real world. The knowledge acquired will help managers avoid designing wildlife conservation programs that apply controversial management options, and thus lower public tolerance toward the species. The third article, "Wildlife management: a tool to foster coexistence or to increase conflict between humans and wildlife?" identifies and proposes wild boar management strategies that foster coexistence and are supported by local communities. To date, no research has been carried out in Italy investigating opinions toward wild boar management from a general public and interest group perspective. As wildlife management involves listening and working with people, understanding human preferences toward wildlife management itself is the first step in increasing tolerance (Bath and Enck, 2003). This paper has been formatted to be compatible with the requirements of the *European Journal of Wildlife Research.*

This dissertation demonstrates that to build a wildlife-tolerant society, all types of human-wildlife interactions need to be better encompassed in wildlife management and conservation. Human perceptions of conflict and coexistence should not be considered separately; they should be envisioned as opposite but interrelated concepts found at either end of a continuous line. Furthermore, a multidisciplinary approach that considers values, cultures, and geographical locations, among other factors, is needed. Successful wildlife management and conservation is not only about implementing the biophysical perspective of human-wildlife interactions; it is also about encompassing the sociological factors influencing wildlife decision-making processes (Riley et al., 2002; Mascia et al.,

2003). By exploring human-wildlife interactions in depth, by designing a conflict-coexistence continuum framework, and by creating an interface between cultures, protected areas and wildlife management, this dissertation demonstrates the need for a paradigm shift in the concept of human-wildlife conflicts in the HD field. By considering neutral and positive human-wildlife interactions while addressing conflicts, researchers and managers will encompass all types of human-wildlife interactions in wildlife management and conservation, and enhance coexistence between people and wild species.

2. Introduction

Worldwide human-wildlife encounters have changed in number and frequency over the centuries, as the physical separation between wildlife and human space has become blurred (Woodroffe, 2000; Choudhury, 2004; Madden, 2004a; Jenkins and Keal, 2004; Woodroffe et al., 2005; Messmer, 2009). Bears in campgrounds (Gore et al., 2007), raccoons in residential gardens and garages (Miller et al., 2000), and white-tailed deer and coyotes in suburban areas (Lauber and Knuth, 2004; Raik et al., 2005) are just a few common examples of today's human-wildlife interactions. While the presence of a deer near a human settlement may be tolerated, a bear, mountain lion, or wolf close to a rural community can be considered an unacceptable threat to human livelihood (Gore et al., 2005; Kaltenborn et al., 2006). Negative experiences with wildlife, concerns about safety risks and economic issues, and competition with wildlife species for space and resources (Reynolds and Tappen, 1996; Kaczensky, 1999) are just some of the factors influencing an individual's willingness to tolerate wildlife in human environments.

Depending on the species and type of human-wildlife interaction involved, negative or positive attitudes and beliefs toward wildlife arise (Woodroffe et al., 2005). These can lead to a situation of conflict or coexistence between people and wild animals. Human-wildlife interactions creating conflict can range from a small nuisance to a major conflict; interactions leading to coexistence range from a slight, tolerated annoyance, to integration and acceptance of wildlife within the human-shaped landscape. While it might be easy to identify conflict situations, such as people competing over space and food

sources with animals (Woodroffe et al., 2005), or the achievement of coexistence, such as in successful large carnivore management (Bath and Majic, 2001), the challenge is to identify the point at which negative attitudes toward wildlife are minimized to the degree that coexistence begins to occur. The key is determining which factors may transform a human-wildlife interaction into either a conflict or a coexistence situation. Negative or positive encounters with wildlife are not only dictated by the species or the possible impacts that species may cause. Socio-cultural factors, and the geographical location in which the species is encountered, play a fundamental role in shaping people's perceptions toward wildlife (Manfredo and Daye, 2004). Specifically, whether a human-wildlife encounter turns into conflict or coexistence relies on how humans in a specific social setting and geographical location define nature and wildlife (Philo and Wilbert, 2000). Therefore, the concept of human-wildlife interaction cannot be restricted to the mere biophysical aspects of such encounters. The social perspective of human-wildlife interactions has to be considered in wildlife management and conservation, as the public's perceptions toward species often define the role wildlife should hold in human-shaped landscapes and communities (Lynn, 1998).

Human-wildlife interactions and conflicts over space are rooted in a long history of changing biophysical connections and of changing cultural attitudes towards animals and non-human nature. As Rolston (1989) stated in *Philosophy Gone Wild*, nature has no intrinsic value in itself; there is only the value people attribute to nature while experiencing it. The role and place people give to nature and wildlife often forms the foundation of their negative or positive attitudes toward wild species. To better

understand the meaning people in Western cultures assign to nature and wildlife, an overview of the social and cultural connotations humans have held about nature over the centuries is examined in this manuscript (Philo and Wilbert, 2000; Knight, 2000). A deeper knowledge about how nature has become a social construct, and how humans have become separated from their environment, will enable a better exploration of the roots of human-wildlife conflicts, and a clearer understanding of the role HD can play in better addressing human-wildlife interactions in management and conservation projects

2.1. Nature and wildlife: a Western society perspective

Throughout history, wildlife and the natural world have affected Western cultures. The existence values early nomadic and hunting societies attributed to nature and wildlife, integrated with the knowledge required to survive, made human beings an integral component of their environment (Oelschlaeger, 1991; Woodroffe et al., 2005). The concept of people being deeply connected to their past as gatherers and hunters, and dependent upon natural cycles (Kruuk, 2002), evolved into feelings of separation from nature as humans settled down and embraced an agricultural lifestyle (Oelschlaeger, 1991; Inghold, 1994). This detachment was strengthened by the domestication of animals, and the increasing separation of humans from wild food sources (Manning and Serpell, 1994; Emel and Wolch 2002). Domestication not only put humans at a higher level than animals, it also defined the location of humans and animals, creating a division between culture and nature (Oelschlaeger, 1991; Manning and Serpell, 1994; Anderson, 1997).

The notion of separate human and natural worlds found further expression in religious and scientific ideas in the Middle Ages as humans began to view nature and wildlife as created for human benefit (Evernden, 1992; Manning and Serpell, 1994). Monotheistic religions supported the use and transformation of nature by humans, and Western society's dominance over the environment (Cronon, 1995; Wolch and Emel, 1998; Nash, 2001). The unrestrained use of animals as resources became seen as justified by God (Cronon, 1995; Wolch and Emel, 1998; Nash, 2001). As a result, humans were even more embedded in their culture and moved further from nature (Evernden, 1992; Manning and Serpell, 1994). During the Italian renaissance, the notion of nature and wildlife as detached and unrelated from humans emerged clearly (Evernden, 1992; Manning and Serpell, 1994). Leonardo da Vinci stated in the *Atlantic Code* (1478-1519) that "Reason is the immanent, unbreakable law governing nature. Sense, sensation, or the immediate feeling for life can no longer serve as the means by which we assimilate nature and discovers her secrets" (Cassirer, 1963, p.156). Da Vinci thus introduced the concept that the true shape of nature could only be understood through scientific approaches. The idea of using rational reasoning while exploring the concept of nature has further expanded during the European enlightenment (Manning and Serpell, 1994). Nature could be discovered and defined from an intellectual, scientific, and cultural perspective, since humans were no longer perceived as part of nature itself (Evernden, 1992). As humans became detached observers of their environment and its laws, power once given to nature was transferred to human beings, making humans external and sovereign over nature (Evernden, 1992). The creation of this boundary between culture and nature, as well as civilization and wilderness, became the core definition from which

the concepts of nature and wildlife evolved over the next two centuries (Nash, 2001; Creager and Jordan, 2002).

The belief in the separation and dominance of humans over nature was challenged by scientific and philosophical developments in the 19th and early 20th centuries (Oelschlaeger, 1991; Nash, 2001). This change was challenge driven by Charles Darwin's theories of a common ancestor for all species, humans included (Darwin, 1859; Oelschlaeger, 1991). Edmund Burke, Immanuel Kant, and William Gilpin also contributed to this new vision of nature with early ideas of sublime landscapes as places where humans have the best chance of glimpsing the face of divinity (Manning and Serpell, 1994; Cronon, 1995). With the development of romantic movements, and with the start of industrialization and urbanization between the end of the 19th century and the beginning of 20th century, this change in perception toward nature reached a peak. Social meanings were assigned to the environment, and nature became a source of salvation from society and a respite from the pressure of modern life (Manning and Serpell, 1994; Cronon, 1995; Nash, 2001). Henry D. Thoreau exemplified this new approach to nature with his transcendentalist idea of wilderness as sublime and a source of spiritual solitude (Oelschlaeger, 1991; Nash, 2001). With John Muir promoting nature preservation for its beauty, spiritual truth, innocence, and purity, a further shift from nature "as only for use" to nature as "to be cared for" took root in Western societies (Manning and Serpell, 1994; Oelschlaeger, 1991; Nash, 2001). In this period, national parks such as Yellowstone (1864) and Yosemite (1890) were created to preserve pristine nature (Rothman, 2000). Despite this growth of empathetic feelings toward the environment, the early 20th

century was characterized by ambivalent attitudes toward nature, wilderness, and wildlife (Rothman, 2000; Nash, 2001). While social meanings of nature and its preservation were being developed through romantic movements, rapid human population growth, industrialization, and urbanization created pressures for the allocation and use of resources to increase human wealth and livelihoods. By advocating for the conservation of nature through planned use and renewal, Gifford Pinchot introduced the idea of wise and economically efficient employment of resources (Rothman, 2000; Nash, 2001). As a result, a division – between preserving and exploiting nature and wildlife – took root in Western societies (Evernden, 1992; Rothman, 2000; Nash, 2001).

Debates over the human use of nature persisted into the mid and late 20th century. In this period of economic development, growth, and exploitation, Aldo Leopold criticized the domination of Western societies of nature (Knight and Riedel, 2002), and advocated for wilderness conservation techniques that aimed to restore and maintain intact ecosystems (Nash, 2001; Knight and Riedel, 2002). Despite Leopold's suggestion that Western society adopt "one of the focal points of a new attitude an intelligent humility toward man's place in nature" (Flader, 1994, p.29), only with the realization that resources were limited, and that overexploitation and pollution had transformed the natural landscape into a toxic dump, did tension between progress and conservation reach the forefront of discussions (Nash, 2001; Rothman, 2000). A key shift in the idea of nature was driven in this period by the development of mass environmentalism that saw nature conservation as the way to achieve a change in the quality of people's life. Rachel Carson's *Silent Spring* (1962), Paul Erlich's *The Population Bomb* (1968), and Garrett

Hardin's "The tragedy of the common" (1968) exemplified a new understanding of human impact on nature and of the need for a societal change toward the environment. Nevertheless, environmental movements failed to halt the continued transformation and exploitation of natural spaces (Rothman, 2000). In the last two decades of the 20th century, the duality of preservation-exploitation became an integral part of modern Western culture, and of the relationship toward nature and wildlife (Evernden, 1992).

Increasingly, scholars examining human-nature relations have rejected this dichotomy, examining ideas of nature and wilderness as social constructions (Bird, 1987; Fitzsimmons, 1989; Cronon, 1995; Creager and Jordan, 2002; West et al., 2006). As demonstrated by the extensive literature on the history and cultural creation of human-wildlife relationships (Knight, 2000; Philo and Wilbert, 2000; Emel and Wolch, 2002; Creager and Jordan, 2002; Clayton and Opotow, 2003), the construction of nature and wilderness is deeply embedded in human social identity. A better understanding of Western society's relationship with nature and wildlife, as outlined in this section, indicates that ecological problems and human-wildlife conflicts often stem from society's definition of nature and wildlife (Evernden, 1992; Clayton and Opotow, 2003; Johansson, 2008). In exploring the detachment of humans and the non-human environment from a Western perspective, it becomes clear that mutually exclusive spaces for people and wildlife have been created (West et al., 2006; Johansson, 2008). This is especially true in the cases of urban areas (human spaces) and protected areas (wildlife places). A wild species may be accepted by humans, or perceived as a threat, depending on where a particular society draws the ideological and physical borderline between culture and

nature (Knight, 2000; Philo and Wilbert, 2000; Creager and Jordan, 2002). The separation between human and wildlife spaces as the foundation of negative or positive attitudes toward wildlife, and as reason for conflict between or coexistence of humans and wildlife, is examined in the next paragraphs.

2.2. The creation of human- wildlife boundaries and the rise of conflict

One of the reasons for the exclusion or inclusion of a species in a particular landscape is the societal definition of where humans and animals belong (Wolch and Emel, 1998; Johansson, 2008). Since the early days, people have assigned particular meaning to animals, and have dictated specific socio-cultural spaces in which species are supposed to remain (Philo and Wilbert, 2000; Johansson, 2009). Societies have determined which animals to include or exclude from the human-shaped landscape by defining them as domasticated animals, pets, game species, protected species, or nuisance species (Knight, 2000; Philo and Wilbert, 2000; Naughton-Treves, 2002; Woodroffe et al., 2005). When animals recognized by society as wild, feral, or undomesticated expand to areas where they should not be, according to human criteria (e.g., traditions, norms, beliefs), then the imaginary boundary between culture and nature is crossed and the animal becomes an "intruder" in a human-shaped landscape (Creager and Jordan, 2002; Johansson, 2008). The appearance of undesired wildlife inside a socio-cultural landscape can make a species a vermin, pest, or competitor that needs to be controlled or exterminated (Knight, 2000; Philo and Wilbert, 2000; Johansson, 2008; Johansson, 2009). The tipping point between accepting a species or not is determined by the criteria

people use to define species. It is also affected by the line, drawn by society, between peoples' space and animals' place (Creager and Jordan, 2002; Clayton and Opotow, 2003).

The creation of human-wildlife boundaries has led to the establishment of exclusive locations for people and animals. Society clearly recognizes urban and agricultural landscapes as spaces for people and domesticated species. Wilderness and protected areas, on the other hand, are wildlife places (Knight, 2000; Creager and Jordan, 2002). However, the separation between the two has never been as clear as humans might think or want. This is particularly true in Europe, where people and wildlife have shared the same landscape for millennia, and where protected areas have been established in highly humanized areas. Thus, the division between human and wildlife places are even more blurred in some highly populated parts of the world (e.g., Europe) than in others (e.g., North America) (Woodroffe, 2000; Choudhury, 2004; Jankins and Keal, 2004; Woodroffe et al., 2005). With the expansion of human settlement near wildlife, and the arrival of species such as coyotes and foxes in urban areas, human-wildlife interactions have changed. It has become an everyday occurrence for humans and animals to cross cultural and geographical borderlines and enter into the other's sphere. These borderlands between human and wildlife places can be seen as a melting pot for better coexistence between humans and wildlife. They are also areas where the needs and behaviours of animals overlap and clash with human wants and goals (Madden, 2004a; Johansson, 2009). In reality, borderlands are frequently perceived by societies as a source of human-wildlife conflicts, rather than of coexistence.

The concept of mutually exclusive land for humans or wildlife has been made even more tangible by the creation of protected areas in the name of biodiversity and nature conservation (West et al., 2006; Binnema and Niemi, 2006). First established over 2000 years ago to preserve sacred sites or to create royal game preserves, the idea of setting aside land for conservation spread around the world mostly in the 20th century (Eagles et al., 2002; Possimgham et al., 2006). Countries have been driven to start preserving nature for different reasons. In North America, protected areas were established to conserve sublime sceneries (Jacoby, 2001; Warren, 1997), while in Africa and Europe to establish game reserves and to protect unique landscapes (Possingham et al., 2006; Phillips, 2007). Common features characterized these emerging protected areas. They were established by governments, they had different surfaces with relatively natural environments, and they were either accessible to everybody or created for few aristhocrats (Eagles et al., 2002). Protected areas were created around areas in use by humans, as well as in remote areas (Jacoby, 1965; Warren, 1997). In many cases, authorities felt entitled to evict humans from specific locations to preserve nature (Weladji and Tchamba, 2003; West and Brockington, 2006; Groom et al., 2006; West and Brockington, 2006; Binnema and Niemi, 2006; Manfredo et al., 2009). By establishing protected areas, society has tried to confine wild animals inside parks (Naughton-Treves, 1999; Bath and Enck, 2003; Osborn and Hill, 2005) and relocate humans outside of them (Weladji and Tchamba, 2003; West and Brockington, 2006; Groom et al., 2006; West and Brockington, 2006; Manfredo et al., 2009). When protected areas have been created without displacing local communities, conservation strategies that minimize human-wildlife encounters have been applied. As a consequence, wildlife management and conservation often focuses on whether people

and wildlife are inside or outside the boundary of a protected area (Grant and Quinn, 2007). This differentiation between inside and outside the protected areas boundaries has often favored the idea of separation between humans and wild animals.

As conservation efforts frequently take place in heavily human inhabited environments, protected areas are no longer just a wildlife conservation tool; they are also laboratories of social, political, and economic change worthy of study (West and Brockington, 2006; West et al., 2006; Ogra, 2008). As stated by West et al. (2006, p. 252), protected areas can "change the face of the earth by renaming places, drawing boundaries around areas, and erasing boundaries between states." The establishment of protected areas affects both wildlife and human society: wildlife, by limiting their potential home range; and society by reducing the access of people to natural resources and by changing use rights and power relationships (West and Brockington, 2006; West et al., 2006). Protected areas can be places of tension, as the public interface and collide with conservation authorities on how to manage wildlife and other natural resources (Madden, 2004a; Manfredo et al., 2009). In border zones, where there is an overlap between human and wildlife habitats, the clash over wildlife management has become even more evident as species and human communities are closer to each other and compete with each other over the same space and food sources (Woodroffe et al., 2005; West et al., 2006; Ogra, 2008; Johansson, 2008). These areas are ideal locations in which to explore human-wildlife interactions. Thus, borderlands of protected areas are investigated in this dissertation to help better understand when negative or positive human-wildlife experiences turns into conflict or coexistence.

2.3. Human-wildlife interactions

Competition for food and a reduction in natural habitats are among the factors that have moved wildlife and humans closer, making human-wildlife interactions more frequent (Woodroffe, 2000; Madden, 2004a; Choudhury, 2004; Jankins and Keal, 2004; Woodroffe et al., 2005; Messmer, 2009). Although such interactions can be positive or negative, conflict is more often considered than coexistence (Madden, 2004b; Peterson et al., 2010). There is good reason for this. When species enter human space and threaten humans and their property, causing damage and raising safety concerns for communities or individuals living with wild species, human-wildlife interactions become negative experiences (Conover et al., 1995; Conover, 1998; Messmer, 2009). The fear of wild animals that may attack people or livestock, or damage crops, frequently leads to human-wildlife conflicts (WWF, 2005). Negative feelings toward wildlife also arise when individuals are forced to carry out extra work or lose sleep to protect agricultural land, livestock, or settlements from wild animals (WWF, 2005). Direct costs, such as human fatality, livestock depredation, and crop-raiding, as well as indirect costs, including the time and money spent to prevent damages, are recognized as the main factors influencing the willingness of people to tolerate wildlife in their proximity (Messmer, 2000; Madden, 2004a; Woodroffe et al., 2005, Messmer, 2009). When communities perceive that the economic and social costs outweigh the benefits of living near animals, negative attitudes toward wildlife occur (Messmer, 2000; Woodroffe, 2000; Madden, 2004a; Woodroffe et al., 2005; Treves et al., 2006).

Real or perceived negative economic, social, or political interactions between humans and wildlife generate human-wildlife conflict (Messmer, 2009). As clarified at the IUCN World Park Congress in 2004, "Human-wildlife conflict occurs when the needs and behaviour of wildlife impact negatively on the goals of humans or when the goals of humans negatively impact the needs of wildlife. These conflicts may result when wildlife damage crops, injure or kill domestic animals, threaten or kill people" (Madden, 2004a, p. 248). To date, conflicts have been mainly addressed without considering the coexistence of humans and wildlife; there is a need to explore both concepts in the same research, at the same time. This dissertation addresses this gap by exploring conflict and coexistence together; it also characterizes human-wildlife conflicts from a biophysical and social science perspective. Only through a better understanding of conflict situations will it be possible to understand the nature of negative interaction between humans and wildlife and start to work toward coexistence.

2.3.1 Conflict from a conservation biology perspective

Traditionally, the conservation of nature and wilderness has focused only on protecting species, their habitats, and ecosystems to foster natural processes and preserve resources for human use (Anderson et al., 1987). More recently, conservation biology (Soule, 1985), a multidisciplinary approach based on scientific knowledge, ecological principles, sustainable economics, and best conservation practices, has been developed and established to better protect wild species (Groom et al., 2006). The enhanced biological understanding of species conservation challenges enables wildlife managers to increase animal populations and to restore them where they had been missing (Groom et

al., 2006). The return of wolves (*Canis lupus*) to Yellowstone in the United States (McNamee, 1997), the re-establishment of the European bison (*Bisons bonasus*) in Bialowieza, Poland (Puĉek et al., 2004), and the increase of the giant panda populations (*Ailuropoda melanoleuca*) all over China (Swaisgood et al., 2009) are just three successful stories of conservation. Conservation achievements, such as the restoration of wildlife populations, have been controversial when they favour extending the home range of "unwanted" species to rural and urban landscapes (Messmer, 2000; Madden, 2004a, Woodroffe et al., 2005). For example, as the population of wolves grew in Yellowstone, predation on livestock increased (Bangs and Shivik, 2001). To reduce the resulting hostility toward the wolf reintroduction project, compensation systems and preventive methods were applied by managers. Nevertheless, conflicts over wolf management have grown in the communities living near the reintroduction sites, and have resulted in discontent over the presence of wolves in proximity to people (Bath and Buchanan, 1989; Mc Namee, 1997; Bangs and Shivik, 2001).

Often the success of conservation projects has been jeopardized by not addressing wildlife conservation challenges with the communities directly affected by wild species (Mascia et al, 2003). Local communities have responded to wildlife impacts by chasing, persecuting, or killing "problematic" animals (i.e., wildlife that damage or potentially impact crops, livestock, or humans) (Skonhofta and Solstada, 1996; Nyhus et al., 2003; Madden, 2004a; Woodroffe et al., 2005; Treves, et al., 2006). Although wildlife managers have applied different wildlife management practices to address wildlife impacts, species perceived as difficult neighbours, pests, or competitors have undergone

persecutions and have often become endangered or extinct, despite intensive conservation efforts (Madden, 2004a; Woodroffe et al., 2005; Treves et al., 2006). By dealing only with the biophysical aspects of wildlife management in isolation from human factors (Bright and Manfredo, 1995; Blanchard, 2000), conservation biologists have often not recognized "that conservation is about people as much as it is about species or ecosystems" (Mascia et al., 2003, p.649). Different views held by wildlife managers and local communities about how species should be conserved and managed are frequently at the root of wildlife conflicts with humans, and the reason behind local communities' opposition toward species and conservation projects (Woodroffe et al., 2005).

2.3.2 Conflict from a social science perspective

Controversies over wildlife are not only generated by the differing views held by people over species management. As demonstrated in this dissertation, controversy also comes from society's concepts of the culture-nature dichotomy and the social construction of nature. Both are important concepts to help understand human-wildlife conflicts, as they influence society's relationship toward nature and wild species (Mascia et al., 2003). Specifically, by investigating the evolution of human identities through nature and wildlife, and by paying close attention to human relationships with other life forms, researchers have demonstrated how these concepts influence human connections toward wildlife. Anthropological research has shown how the symbolic and cultural dimension of wildlife threats influences public beliefs and behaviours toward species (Knight, 2000; Mullin, 2002). This discipline also centers on the tension/division in human society between cherishing and exploiting wildlife, and on the anthropological

contextualization of human-wildlife conflicts (Mullin, 2002). Animal geography has gone further in the investigation of human-wildlife relationships by exploring the matter of species "in" or "out" of place (Lynn, 1998; Wolch and Emel, 1998; Philo and Wilbert, 2000) and by focusing on human-wildlife interactions in "borderland" areas (Manning and Serpell, 1994; Johansson, 2008; Johansson, 2009). The relationship with nature and wildlife among and within different sectors of society has been considered by evaluating how humans have created their identities through nature, and by taking into account human-wildlife boundary effects. Through such an understanding, these disciplines have provided direction for the development of locally sensitive and culturally compatible wildlife management strategies and policies (Knight, 2000). They have also helped managers identify when human-wildlife interactions are most likely to turn into human-wildlife conflicts (Knight, 2000).

A good understanding of the anthropological contextualization of wildlife and the culture-nature dichotomy is often not enough to fully comprehend and address human-wildlife conflict situations. There is also a need to understand the values, beliefs, attitudes, and behaviours people associate with wild species (Bath and Enck, 2003). The complex interplay of emotional, mental, spiritual, social, and cultural connections people have with nature and wildlife (West and Brockington, 2006; West et al., 2006; Johansson, 2009) play a fundamental role in determining whether a human-wildlife interaction will turn into conflict or coexistence. Human dimensions (HD) of wildlife provides a better understanding of the social factors influencing human perceptions toward wildlife by focusing on "how people value wildlife, how they want wildlife to be managed, and how

they affect or are affected by wildlife and wildlife management decisions" (Decker et al., 2001, p.3). Understanding public perceptions toward wildlife is not the only task of HD. This discipline also addresses the required step toward human-wildlife conflict resolution by involving people directly affected by species in wildlife decision-making processes and by designing awareness and educational campaign programs (Bath, 1996; Decker et al., 2001; Ericsson et al., 2004). Integrating the public in conservation projects is fundamental for effective wildlife management (Blanchard, 2000; Ericsson et al., 2004), as individual people have distinct opinions about whether they want more or less animals, if they will tolerate more or less damage, and if they will coexist with wildlife or not. Managing wildlife and properly addressing human-wildlife conflicts is not only about species, but also about listening and working with people.

2.4. Human dimensions of wildlife: a European and Italian overview

The growing need to involve people in wildlife management and the role played by HD in implementing conflict resolution and species conservation has led to the acknowledgment of this discipline all over the world (Manfredo et al., 2009; Miller, 2009; Glikman and Frank, 2011). Although HD has become an applied and academically accredited discipline in North America in the last fifty years (Manfredo et al., 1998; Manfredo et al., 2009), HD studies have been only carried out consistently in Europe since the 1990s. The vast majority of these studies (91%) date after 1994; many were carried out in Norway (18%) (Glikman and Frank, 2011). Additionally, a substantial amount of the literature is published in the native language of the country in which the

research is conducted (30%), and the main theme explored is the attitude of the general public or specific interest groups toward large carnivores (i.e. wolf, bear) (Glikman and Frank, 2011). Recently, in Italy, HD approaches have been applied when exploring people's attitudes toward wildlife and its management. With thirty-two studies carried out since 2003, this discipline remains relatively new in the Italian peninsula (Glikman and Frank, 2011). HD has been most often applied in isolated case studies to collect data from the general public on large carnivores (56%) during a conservation crisis, and has not resulted in participants' ongoing engagement in wildlife conservation decision-making processes (Glikman and Frank, 2011). Specifically, 42% of the HD research performed in Italy has focused on both wolves and bears and has included data from large sample groups (e.g., 400 or more interviews) (Glikman and Frank, 2011). When HD has been used in wildlife management projects (Monaco et al., 2003; Carnevali and Scacco, 2009; Monaco et al., 2010; Glikman and Frank, 2011), no real local community involvement has occurred.

Park agencies have recognized the need to engage the public in wild boar management (Monaco et al., 2010), for example, as the conflicts generated by this species are often more socio-political in nature than biological (Carnevali and Scacco, 2009). Conflicts can arise from the fact that wild boar cannot be hunted inside protected areas; such challenges create controversies over how to manage the species. Meetings with the main interest groups to share data about wild boar management in protected areas have been organized, and HD studies on local attitudes toward wild boar have been completed in several protected areas of Italy (Panchetti, 2003; Frassanito, 2005; Rulli and

Savini, 2008; Carnevali and Scacco, 2009; Pontuale, 2009). The meetings and the HD studies have remained baseline data collection tools, however, and have not resulted in participants' engagement in wild boar management decision-making processes. Since managers in Italy do not really recognize public participation as a way to foster species conservation and management, and this research approach is not set up as a true participatory process, HD research remains an academic exercise with no impact on the ground (Glikman and Frank, 2011). As was the situation in North America in the late 1980s (Decker et al., 1987), HD in Italy and in most of Europe is not yet established as a discipline. It suffers from a lack of an interface between biophysical and social science research and it is undermined by the unwillingness of conservation authorities to truly involve the public in conservation projects (Glikman and Frank, 2011).

This dissertation contributes to the HD field by using a participatory approach (i.e. face-to-face interviews and facilitated workshops) that document the attitudes and beliefs of residents toward wildlife issues in a quantitative and representative way. Never before has such in-depth research been used in Italy to document attitudes toward wild boar and wild boar management, to explore public attitudes about wild boar inside and outside protected areas, or to integrate the perspective of multiple interest groups. Additionally, this HD study aims to acknowledge conflict and foster coexistence by building long-term partnerships between the various interest groups living in and around protected areas

3. Research questions and objectives

HD research has traditionally focused on human-wildlife interactions (Decker et al., 2001, Woodroffe et al., 2005; Manfredo, 2008; Manfredo et al., 2009). Although such interactions can shape a full range of positive to negative perceptions toward wildlife, researchers have conventionally looked at the negative side, as exemplified by the vast literature on human-wildlife conflicts (Messmer, 2000; Manfredo and Dayer, 2004; Distefano, 2005; Treves et al., 2006; Messmer, 2009; Peterson et al., 2010). Negative attitudes toward wildlife are frequently investigated to better understand public perceptions of fear and risk (Renn, 1992; Sjoberg, 1998), livestock depredation (Kaczensky, 1999; Breitenmoser et al., 2005), and crop-raiding (Gillingham and Lee, 2003; Osborn and Hill, 2005). Concerns about species management and conservation are frequently explored from a conflict perspective (Woodroffe et al., 2005); human-wildlife conflicts are generally addressed by applying management strategies such as compensation systems and methods to prevent or reduce damages inflicted by the species (Nyhus et al., 2005). However, no clear relationship between reducing wildlife impacts and increasing tolerance toward species has been demonstrated (Naughton-Treves et al., 2003; Madden, 2004a; Peterson et al., 2010). Negative human-wildlife interactions are shaped by competition over resources, as well as by the way in which individuals or interest groups interpret a specific interaction with wildlife and envision the solution to that situation. If people understand the problem differently, and envision different solutions for the issue, the problem is classified as "wicked", according to Rittel and Webber's (1977) planning theory (Jentoft and Chuenpagdee, 2009).

This focus on conflict has often been a constraint to wildlife conservation, as resource managers have centered on reducing negative experiences, rather than on increasing positive interactions between humans and wildlife (Peterson et al., 2010). Addressing conflict alone does not maximize the opportunity for coexistence between people and wildlife. By framing conservation challenges from the conflict perspective only, the array of solutions that researchers and managers have used to deal with wildlife issues has been limited. For example, park authorities have commonly addressed conflicts caused by livestock and crop damages by offering compensation and preventive methods to the public, or by promoting wildlife population control inside protected areas. Such approaches, however, are only some of the management tools conservation authorities could be using to tackle wildlife damage issues. Strategies that are more likely to foster tolerance, such as engaging the public in wildlife management, and educating individuals about the real impacts caused by wildlife to livestock and agricultural land, could also be employed. To work toward solutions that maximize conservation success, resolution techniques that include all types of interactions, especially positive interactions, tolerance, and coexistence toward wildlife conservation and management, must be applied.

3.1 Human-wildlife coexistence and the conflict-coexistence continuum

A number of factors help determine whether a human-wildlife interaction will be perceived as an example of conflict or coexistence. These factors include, but are not limited to, the species involved, the location in which the wildlife is encountered, and the

personal interest the person has toward the animal (Riley et al., 2002; Madden, 2004b; West and Brockington, 2006; West et al., 2006; Johansson, 2009). Human-wildlife conflicts are real or perceived biological, economic, social, or political negative interactions between humans and wildlife (Messmer, 2009). These conflicts are comprised of two different but closely related dimensions: wildlife damaging humans and humans impacting wildlife (Madden, 2004a). Human-wildlife conflict can arise as a result of crop damages, livestock depredation, animals killing people, humans poaching wild animals, humans killing "problematic" species, and so on (Conover, 1998; Massei and Genov 2004; Messmer, 2009; Massei et al. 2011).

HD researchers have used the term coexistence to describe tolerance or a range of positive interactions between humans and animals (Nepal and Webe, 1995; Vaske et al., 1995; Clark et al., 2005; Hudenko-Wieczorek and Decker, 2008). Recently, the idea of exploring coexistence - and thus changing the labelling of *human-wildlife conflicts* to *human-wildlife coexistence* or *human-wildlife interactions* - has emerged (Madden, 2004a, b; Peterson et al., 2010). Specifically, HD studies have focused on how human-wildlife coexistence can be conceptually and practically increased (Madden, 2004a), how tolerance and coexistence can be used in conservation initiatives (Madden, 2004b), and how the representation of the idea of coexistence can reframe biodiversity challenges (Jentoft et al., 2010; Peterson et al., 2010). The emphasis of the literature, however, has been on shifting from conflict to coexistence, rather than on exploring conflict and coexistence together. Before being able to effectively address positive to negative interactions together, specifically in regards to wildlife management and conservation, a

better sense of how and when coexistence between humans and wildlife occurs is required. For this dissertation, coexistence is defined from a human dimensions perspective as people peacefully sharing the environment with animals. Since species are perceived as part of the environment in which humans live, human-wildlife interactions are seen as part of the natural cycle, not as a source of conflict. Coexistence occurs when people perceive wild species as beneficial to their personal, cultural, economic, social, or political well being (Madden, 2004b). It also happens when humans tolerate wild species in their proximity. People demonstrate their willingness to coexist with wildlife and play a positive role in fostering the presence and conservation of species by donating towards conservation, investing in ecotourism, and supporting laws to regulate the killing, trading, and trapping of species (Madden, 2004b), for example.

This dissertation explores whether the concepts of conflict and coexistence can be defined and placed along a continuum. The negative end of the continuum includes perceptions ranging from a major conflict to a small nuisance; the next part of the continuum is neutral, where neither positive nor negative feelings are associated with wildlife; this then moves toward the positive end of the continuum, which represents everything from a feeling of tolerance on to the full integration and acceptance of wildlife within the human landscape. For example, high levels of human-elephant conflicts have been recorded in southern India, where 17% of female elephants have been killed by local communities to defend their agricultural land from crop raiding (Thirgood et al., 2005). At the other end of the spectrum, elephant conservation efforts in and around the Kabini reservoir and the Nagarhole National Park in Karnataka in southern India have

been credited with creating a high degree of tolerance toward crop raiding as local Hindu communities perceive "that elephants had equal rights to [people's] lands" (Venkataraman, 2000, p.1532). Human-elephant experiences, however, cannot all be classified into strictly negative or positive interactions. In northern India, the degree of conflict and coexistence with elephants varies among territories, depending on the amount of damages, the context, and the location in which human-elephant interactions occur (Choudhury, 2005). Accordingly, in this manuscript, human-wildlife interactions will be considered from a human dimensions perspective as any negative, neutral, and positive perceptions people have toward wildlife, as all those perceptions determine whether people will tolerate a wild species in their proximity.

A specific human-wildlife interaction may be perceived differently in different instances, depending upon public values, cultures, and geographical locations. For example, in Italy (location), migratory birds are traditionally hunted (values) as a food source (culture). In Borneo (location), by contrast, the Kelabit tribe sees migratory birds as the timing indicators of planting season (culture) and as indicators of a good harvest (values) (Madden, 2004b). Values attributed to species are not limited to exploitation and use, as reported in the above example, but include people's fundamental desires and behaviours, based on what is important for them (Fulton et al., 1996; Decker et al., 2001). Perceptions of conflict and coexistence may therefore vary depending on socio-cultural background, attitudes, types of conservation law enforcement, economic benefits, and other aspects of societies living with wildlife.

3.2 The conflict-coexistence continuum framework

To understand the complex issues facing human-wildlife interactions along a conflict-coexistence continuum sensitive to values, culture, and location, a new framework that considers these terms along a continuous line is developed (Figure 3.1). Specifically, the framework includes six sequential steps that help understand and address conflict and coexistence in wildlife management and conservation. The steps are designed to: 1) better understand human-wildlife interactions along the conflict-coexistence continuum; 2) identify and prioritize actions that encompass conflict and coexistence in wildlife management and conservation; and 3) involve the public in management and conservation decision-making processes to better address conflicts and increase coexistence.

The iterative process of optimal decision-making designed in this framework is inspired by the adaptive management and the adaptive impact management approaches (McLain and Lee, 1996; Mitchell, 2002; Riley et al., 2002; Enck et al., 2006). Focused on learning processes and on dynamic management of resources (McLain and Lee, 1996; Mitchell, 2002; Riley et al., 2002; Enck et al., 2006), these approaches allow managers and researchers to systematically test assumptions in order to learn, adapt, and change the project according to the new knowledge and experiences acquired during the process. The adaptive impact management approach better integrates the biophysical and social sciences, and recognizes input from interest groups as fundamental for successful wildlife management and conservation (Riley et al., 2002). Based on these models, a conflict-

coexistence continuum framework integrating biophysical and social science knowledge about human-wildlife interactions has been designed. It tests negative to positive perceptions toward wildlife, investigates the causes behind the range of conflict to coexistence feelings, and allows for the adaptation of proposed actions to address conflict and increase coexistence. It also allows for the further modification of such actions if they are not widely supported by the public living with wildlife. While conflict to coexistence perceptions are related to the specific context in which those actions occur, the idea of conflict and coexistence along a continuum can be beneficially applied for different species, geographical locations, and cultures. Thus, the framework designed in this dissertation can be used to integrate the newly defined conflict-coexistence continuum concept in wildlife management and conservation in other places and for other species.

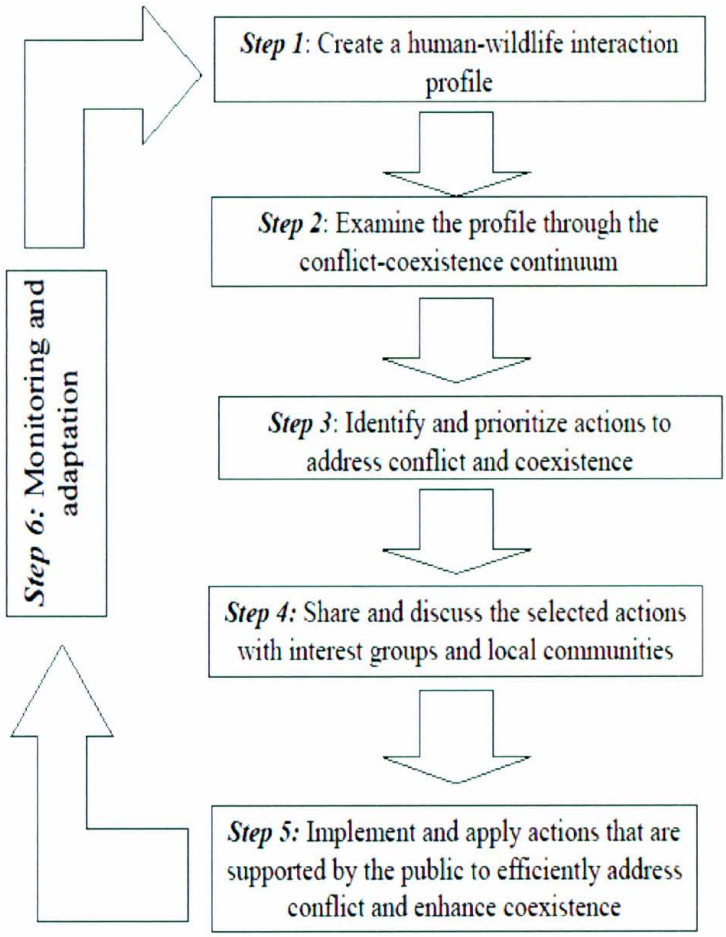

Figure 3.1. Conflict-coexistence continuum framework

Step 1: Create a human-wildlife interaction profile

Based on the definitions reported in the section "Human-wildlife coexistence and the conflict-coexistence continuum," a profile is constructed to describe the different human-wildlife interactions present in an area. Existing biophysical and social-science research should be summarized (Riley et al., 2002; Enck et al., 2006). Possible gaps in

knowledge will be identified in this phase of the framework. After having reviewed all existing information and data, experts should be consulted to better explore all negative, neutral, and positive human-wildlife interactions taking place in the study area (Riley et al., 2002; Enck et al., 2006).

As will be demonstrated in this dissertation, the same human-wildlife interaction may be perceived differently depending upon the location in which people encounter wildlife, the personal interest individuals have toward a species, and other aspects of humans living with wildlife. Thus, values and culture, among other factors, should be considered while building the profile (Riley et al., 2002; Madden, 2004b) to include the background images that determine "what counts as real, important and morally right" for society (Jentoft et al., p. 1316). When possible, the circumstances in which the conflict/coexistence situation arises should also be described in the profile to clarify the foundations of negative to positive human-wildlife interactions (Barlow et al., 2010). By building the human-wildlife interactions profile, managers will detect the main conflict to coexistence situations in the study area, and thus obtain an initial perspective of the wildlife management and conservation problems and opportunities to be addressed in an area (Riley et al., 2002; Enck et al., 2006). The human-wildlife interactions profile obtained in this first phase of the framework enables researchers and managers to design and select objectives to address conflicts and enhance coexistence in the study area.

Step 2: Examine the profile through the conflict-coexistence continuum

Once the objectives have been clearly described and the influencing biophysical and social science factors identified, data can be collected on the intensity of human-wildlife conflict to coexistence interactions in the study area. The conflict-coexistence continuum line (i.e., the Visual Analogue Scale of the first paper) designed and explored in this dissertation can be used as a tool to evaluate more precisely the degree of willingness to tolerate a certain species or a specific interaction with wildlife. By focusing on the intensity of negative, neutral, and positive perceptions toward wildlife, researchers and managers will be able to determine the real wildlife management and conservation problems and opportunities in the study area. The data collected in this phase of the framework may also enable researchers and managers to identify other human-wildlife interactions not considered in the profile. While asking participants to express the intensity of their conflict to coexistence feelings along the continuum line (i.e., the conflict-coexistence continuum question used in the three papers), researchers can gather further information about the social, economic, cultural, and geographical influences present in the study area. Furthermore, by engaging people in wildlife management and conservation, this step will help researchers understand who benefits, or is damaged by, human-wildlife interactions. Thus, participants and interest groups involved in Step 2, as well as new participants, will be further involved in Step 4 of the framework.

Step 3: Identify and prioritize actions to address conflict and coexistence

Once a more detailed picture about conflict and coexistence perceptions has been obtained through the human-wildlife profile in Step 1 and the baseline data collection in Step 2, researchers and managers can start identifying and prioritizing actions that address human-wildlife interactions. Actions that enhance wildlife management and conservation success can be identified from the literature and from previously used strategies; they may also be designed specifically for the study area (Treves et al., 2009; Barlow et al., 2010). In this phase of the framework, it is important to consider all the possible positive and negative outcomes for wildlife and for people generated by the strategies selected. Actions that have a beneficial impact on both humans and animals should be favoured when selecting possible management and conservation strategies. Only in this way will researchers and managers be able to identify and prioritize the best possible management and conservation strategies for a species in a specific area. Priority should be given to the actions that best include biological research and local community involvement in wildlife management (Bath, 1996; Jacobson and Duff 1998; Manfredo et al., 2009). For example, if a species is overabundant in an area and needs to be reduced, wildlife management strategies that actively involve local communities – such as wildlife population control carried out by hunters inside protected areas – or actions supported by the public should be applied. Conservation projects that aim to restore extinct species to specific areas, or that foster the increase of wildlife populations in highly human inhabited areas, should be planned in combination with public involvement activities. Since successful conservation is not only about sound biological research, but also

depends on building partnerships with key interest groups (WWF, 2007), researchers and managers should determine how to engage people, who should be involved, and what role participants should play in planning and implementing the wildlife management and conservation strategies proposed. In this step of the framework, no active involvement of the public is planned.

Step 4: Share and discuss the selected actions with interest groups and local communities

Effective wildlife management is not only about managing species; it is also about listening to people and working with them to establish shared and supported wildlife management and conservation projects (Riley et al., 2002). People decide whether they want more or less animals, whether they will tolerate more or less damages, and if they can coexist or not with wildlife (Bath and Majic, 2001). Sharing responsibilities and ownership represents the first step toward increasing the commitment of local communities toward wildlife management and conservation, ensuring the success of the project over time (Riley et al., 2002; WWF, 2007). Facilitated workshops, focus-group discussions, and other public involvement techniques should be applied to obtain feedback and insight on the proposed actions from the selected interest groups (The Nature Conservancy, 2003). While brainstorming with participants, new information about conflict and coexistence situations in the study area can be gathered. Based on the knowledge held by the interest groups, new actions may be proposed and considered as possible strategies to address conflict and enhance coexistence in the study area (Enck et al., 2006). Possible negative and positive outcomes of the actions being considered should be discussed during this encounter, to make sure participants understand and

accept the potential effects of each action selected to manage or conserve a certain species (Barlow et al., 2010). By discussing the actions envisioned for the study area with the participants, researchers and managers will identify the range of possible management and conservation strategies that can be applied to lower conflict and increase coexistence. They will also determine and agree on the possible role participants could play in implementing wildlife management and conservation in an area in the long term (Riley et al., 2002; WWF, 2009).

Step 5: Implement and apply actions that are supported by the public to efficiently address conflict and enhance coexistence

Determining which actions are widely supported by local communities is fundamental in developing wildlife management and conservation that matters to society (Riley et al., 2002; Enck et al, 2006). A shared understanding of wildlife problems and opportunities will help avoid the creation of wildlife conservation programs that further increase conflict with, rather than enhance public tolerance toward, wild species. The actions proposed in Step 3 should be revised and adjusted based on the improved understanding of conflict and coexistence obtained through discussions with the interest groups in Step 4 (Enck et al., 2006). Participants may suggest actions that harm wildlife or that are against the conservation laws of a country (i.e., killing all wolves in a protected area); managers should select proposed actions that can be implemented in the real world. A new strategic plan should be designed based on feasible changes and suggestions provided by participants. While implementing the strategic plan, the reasons that have brought changes in wildlife management and conservation action should be

documented (WWF, 2007). Keeping track of how the strategic plan has been modified after the public involvement process will show that researchers and managers have embodied participants' suggestions. It will also clarify why changes have been made. Such an approach will increase the likelihood of interest groups supporting wildlife management and conservation in the study area. Once the revision and implementation process is finished, widely supported and accepted actions can be applied on the ground to really address conflict and enhance coexistence between people and wildlife.

Step 6: Monitoring and adaptation

In this framework, monitoring will be used to evaluate if conflict to coexistence perceptions along the continuum change over time due to the application of widely supported wildlife management and conservation actions. Monitoring should occur for the first time after all the framework steps have been carried out, and repeated after a specific span of time (e.g., five years). Variations in tolerance toward a certain species, or toward a specific interaction with wildlife, can be measured by administering a questionnaire to the residents of the study area, using the same conflict-coexistence continuum line from Step 2. Data collected in the early stage of the framework can be then compared with that obtained during the monitoring process. Thus, through monitoring, it is possible to assess how perceptions toward an object have changed, and evaluate the success of such changes. By matching this information, shifts along the conflict-coexistence continuum may be detected. Assessing changes in attitudes over time might be not feasible, however, making monitoring a difficult task. Nevertheless, longitudinal studies are needed to achieve this process. Understanding changes in public

conflict to coexistence perceptions will help researchers and managers assess the validity of the model and evaluate if the actions selected have succeeded to address the human-wildlife interactions. If, five years after a project begins, conflicts have been shown to increase, managers and researchers can review the process, identify the steps that have lead to failure, and start a new cycle, keeping in mind which steps need better implementation, and which options need to be reconsidered.

Testing assumptions through monitoring is necessary in order to adapt and change the project if needed. Monitoring is not the end of the process (Riley et al., 2002); it represents the first step of adjusting and implementing the project with the information and experience gained while carrying out the steps of the framework. It allows for redesigning the human-wildlife interactions profile and for the start of a new cycle through the framework. With this iterative process, the success of wildlife management and conservation projects can be maximized and long-term partnerships between researchers, managers, and the public will be built, based on shared responsibility and ownership of the project.

3.3 Addressing the conflict-coexistence continuum framework: research questions

To understand the complex issues around human-wildlife interactions and to further develop the idea of integrating coexistence in wildlife management and conservation, the overarching goal of this dissertation is to understand if conflict and coexistence can be evaluated along a continuum sensitive to value, culture, and location. The conflict-

coexistence continuum concept and framework is investigated in this dissertation through three papers: a theoretical paper, a methodological paper, and an empirical paper. To understand when conflicts become minimized to the degree that coexistence between human and wildlife begins, each paper's objective and a null hypothesis are related to the conflict-coexistence continuum framework.

Human dimension researchers have traditionally used itemized rating scales to explore public perceptions toward wildlife. The low refinement of this type of scale has not always enabled researchers to deeply explore human-wildlife interactions. As continuous rating scales are believed to have higher accuracy and discrimination power than itemized rating scales (Svensson, 2000; Lange and Söderlund, 2004; Christ and Boice, 2009), two Visual Analogue Scales and Likert-type scales were compared in this methodological paper to test which scale better measures conflict and coexistence. Continuous rating scales have never been used to explore conflict and coexistence themes in HD studies. Understanding if different scale formats generate data with different levels of refinement can lead to designing questions and collecting data in a way that best characterizes public feelings about a specific topic for the conflict-coexistence continuum framework. This dissertation helps in understanding how different scales can be used to evaluate more precisely the degree of public willingness to tolerate or not a certain wild species or a specific interaction with wildlife, thus assessing if the sample population leans toward the conflict or the coexistence side of the balance. This first objective, explored in the paper titled "The conflict-coexistence continuum: a comparison between Likert-type scale and Visual Analogue Scale" and formatted for the journal Educational

and Psychological Measurement, has been carried out in Circeo National Park and in the Regional Nature Reserve Nazzano-Tevere-Farfa.

For the methodological paper, the objective and hypothesis to explore the conflict-coexistence continuum framework are:

1) Understand if Visual analogue Scales can measure the conflict-coexistence continuum in a more refined way than the Likert-type scale.

Ho1: There are no significant differences between the two scales to measure the conflict-coexistence continuum.

From a theoretical perspective, this dissertation investigates for the first time the idea of conflict and coexistence along a continuous line. This second paper examines the conflict and coexistence continuum by focusing on the positive to negative perceptions of residents toward wild boar and its management. The aim is to understand if and how conflict and coexistence perceptions are shaped and influenced by different factors. In order to understand the role played by location as a factor in influencing people perceptions along the continuum, this second paper will focus specifically on the geographical location in which human-wildlife interactions occurs. By examining conflict and coexistence together, this paper addresses the gap created by considering only positive or negative interactions while developing wildlife management and conservation plans. This research goes a step further by investigating differences between participants living inside versus outside the protected area boundary, and determining if conflict and coexistence can be envisioned as a continuous concept that ranges from a major conflict

to acceptance of wildlife within the human landscape. This second objective, explored in the paper titled "Conflict and coexistence in protected areas borderlands: a wild boar case study in Italy" and formatted for the journal Society & Natural Resources, has been based on research carried out in Circeo National Park only.

The objective and hypothesis of exploring the conflict-coexistence continuum framework in the theoretical paper are:

2) Compare perceptions of wild boar and wild boar management held by people living inside versus outside a protected area to explore feelings toward wildlife along the conflict-coexistence continuum.

Ho2: The geographical location in which people encounter the species does not influence their perceptions of conflict and coexistence toward wild boar and its management.

From an applied point of view, this dissertation investigates interest group opinions toward wild boar management. The conflict-coexistence continuum framework is applied in the third paper by exploring areas of disagreement and commonality between interest groups (e.g., Step 4 of the framework). By knowing which management practices are most supported or opposed by interest groups, managers can develop management tools to reduce conflict. This knowledge will enable park authorities to enhance coexistence by engaging interest groups in decision-making processes and thus design wild boar management strategies that are better supported. This paper highlights the need to implement public involvement in wildlife management in Italy and elsewhere as a way to

lower conflict and work toward coexistence. Such engagement of local residents in a meaningful public involvement process has been limited in Italy (Glikman and Frank, 2011). Obtaining baseline data through HD studies is not enough to address human-wildlife issues. There is a need to move beyond the research to build long-term partnerships between the various interest groups through efficient public engagement so opposing views can be tackled as they arise, human-human conflicts can be addressed immediately, and coexistence between wildlife and people can begin. This third objective, explored in the paper titled "Wildlife management: a tool to foster coexistence or to increase conflict between humans and wildlife?" and formatted for the European Journal of Wildlife Research, has been carried out only in RNR Nazzano-Tevere-Farfa.

For the empirical paper, the objective and hypothesis to explore the conflict-coexistence continuum framework are:

3) Explore the support and/or opposition of different interest groups for wild boar management tools to understand which of them foster conflict/coexistence in and around protected areas.

Ho3: There are no differences between interest groups in support and/or opposition toward wild boar management in and around protected areas.

4. Species and study area

Lazio is located in central Italy (Figure 4.1). This region is bordered on the north by Tuscany, Umbria, and Marche; on the east by Abruzzo and Molise; and on the south by Campania. The west side of Lazio overlooks the Tyrrhenian Sea. The territory of Lazio is further divided into five provinces: Rome, Viterbo, Latina, Rieti, and Frosinone.

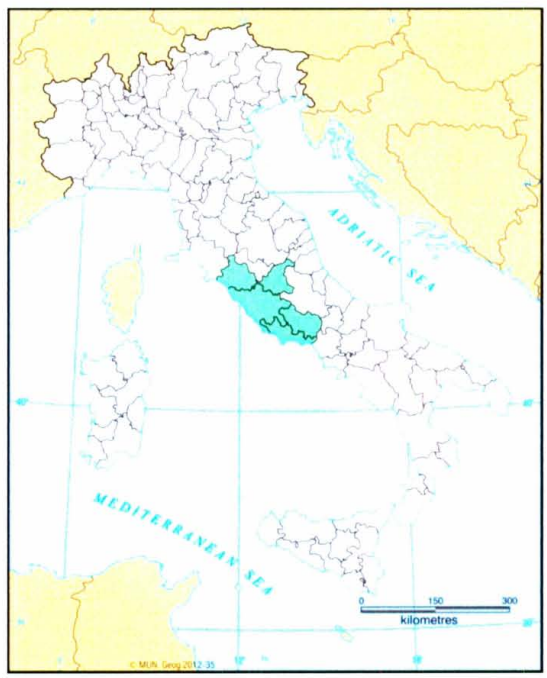

Figure 4.1 Map of Italy (42° 50′ N, 12° 50′ E). Lazio region is highlighted in green.

The unique geology, climate, and geographical position of Lazio have led to the evolution of a complex and diverse natural landscape throughout the region's 1,720,000 hectares (ARP Lazio, 2003). From the Tyrrhenian seaside to the Apennine Mountains,

the variety of habitats – flatlands, wetlands, forests, mountain landscapes, and many others – have encouraged the establishment of a rich biodiversity in this territory (ARP Lazio, 2003). With more than 300 species of vertebrates, including 32 species of amphibians and reptiles, the Lazio region holds 50% of the Italian flora and fauna (ARP Lazio, 2003). In total, 23% of the territory of this region is protected under international, national, or regional laws (ARP, 2011). At a national and regional level, a "Sistema Regionale Delle Aree Naturali Protette del Lazio" (system of nature protected areas) has been developed (Figure 4.2). This system encompasses three national parks (Circeo, Gran Sasso-Laga, and Abruzzo, Lazio and Molise), over 58 protected areas (i.e. nature parks, nature reserve, heritage sites), and a series of state-controlled parks.

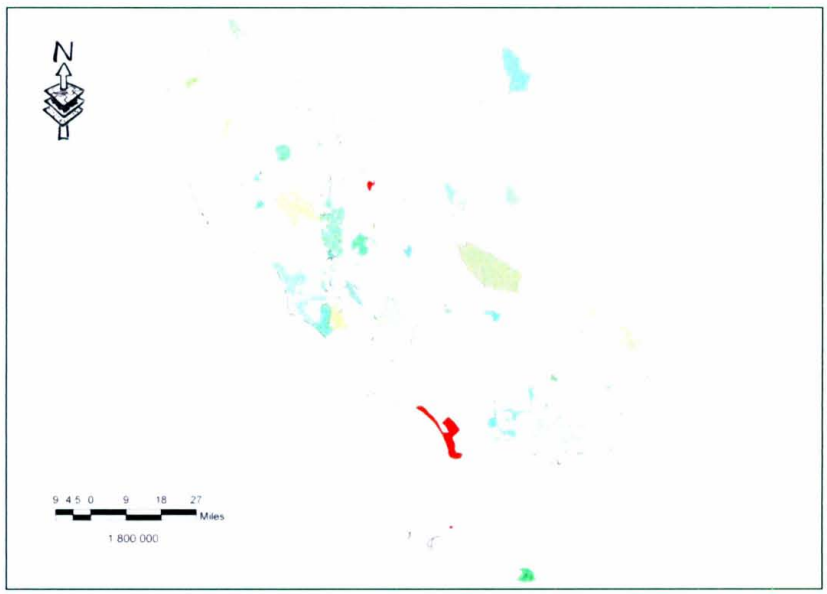

Figure 4. 2 Map of the System of Protected Nature Areas of Lazio Region (41° 53′ 35″ N, 12° 28′ 58″ E). The protected areas are shown in green on the map. The two protected areas used as case studies in this dissertation are highlighted in red.

To assist conservation authorities in protecting biodiversity in such a diverse natural and cultural landscape, the Regional Park Agency Lazio (ARP) was established in 1993 (ARP, 2011). This regional agency has fostered species conservation projects, wildlife management activities, and the sustainable development of protected areas. It has also monitored the status of habitats and species of flora and fauna of European community importance (e.g., Natura 2000) (ARP, 2011). Ungulates, especially wild boar (*Sus scrofa*), have increased in Lazio region in the last 30 years, expanding from protected areas to territories occupied by human activities. ARP has been required to help managers apply integrated strategies inside protected areas to reduce growing wild boar impacts on human economic activities (ARP, 2011).

4.1 Wild boar (*Sus scrofa*)

In Italy, wild boars (Figure 4.3) have a solid body, a short neck and legs, and a big wedge-shaped head (Corbet and Ovenden, 1986). The fur of the adult is thick and brown; the piglets have longitudinal brown and cream-coloured stripes all over their bodies (Corbet and Ovenden, 1986). In spring, female wild boars give birth to an average of five piglets (Boitani et al., 1995; Moretti, 1995). However, the number of offspring varies depending on weather conditions and on food availability (Delcroix et al., 1990). Mothers with the piglets travel in groups up to 18 individuals (Boitani et al., 1995). Adult males are solitary and can be recognized by their larger body size and protruding canines that can reach 10 cm. In Toscani, for example, females have an average weight of 52.5 kg, while males average around 65.7 kg (Pedone et al., 1995). The mean size and

characteristics of wild boars in Italy vary depending on the geographical location and on the ecological conditions of the area (Carnevali et al. 2009). A systematic description of this species is difficult, mainly because wild boars have been crossed with wild races which evolved in other geographical areas and with domestic pigs all over this country (Spangesi and De Marinis, 2002; Carnevali et al. 2009).

Wild boars are present in a variety of habitats, including intensely cultivated areas, foothills, and mountainous zones (Spangesi and De Marinis, 2002; Carnevali et al. 2009). The distribution of wild boars is limited only in areas with harsh winters or without wooded zones or other shelter (Spangesi and De Marinis, 2002; Carnevali et al. 2009). Because wild boar are active mainly during the night and at dusk, zones with dense vegetation are important daytime resting sites (Boitani et al., 1994; Monaco et al., 2003). In Italy, the species has adapted particularly well to the Mediterranean environment ecotype (Spangesi and De Marinis, 2002; Carnevali et al. 2009). The deciduous woods of *Quercus* with bushy areas and meadows pasture represent the ideal habitat for the species (Spangesi and De Marinis, 2002; Monaco et al., 2003; Carnevali et al. 2009). This type of environment is preferred by wild boar since it is rich in food sources such as grass, acorn, olives, chestnuts, and pine kernels (Massei et al., 1996; Monaco et al., 2003). These vegetable species constitute 85% of wild boar diet in Mediterranean habitats (Massei et al., 1996).

Figure 4.3 Wild boar (*Sus scrofa*)

Historically, wild boars have been present and widely distributed throughout the Italian territory. Direct human exploitation of this species has resulted in the local extinction of wild boar in parts of Italy as far back as the 16th century (Carnevali et al., 2009). The wild boar population reached its lowest levels at the end of the twentieth century, when the species disappeared from many parts of the Italian peninsula. The species was reintroduced, for the purpose of hunting, in large numbers in the 1950 and 1960s from central Europe (i.e., Poland, Hungry, former Czechoslovakia) and from breeding farms in several Italian regions (Vernesi et al., 2003; Carnevali et al., 2009). Since then, wild boar populations have started to increase and have continued to expand their home range (Carnevali et al., 2009; Scillitani et al., 2010).

Currently, wild boar (*Sus scrofa*) is the most common ungulate in Italy, with a continuous distribution range of 19,000,000 ha (64% of the Italian territory) and an estimated population of 600,000 (Carnevali et al. 2009). A number of factors have contributed to the continuous expansion and positive population trend of the species, including the release of wild boar for hunting purposes, the depopulation of vast areas in the Apennines, the change of forest coverage, and the decline in direct human persecution for subsistence (Carnevali et al., 2009; Monaco et al., 2010). Additionally, the geographical distribution of the species varies during the year, depending on food availability, the individual's age, population density, size of the group, and many other factors (Boitani et al., 1994; Massei et al., 1997). In Italy, female wild boars can have a home range between 180 ha and 5.000 ha, while the range for the male can reach 220 ha to 10.000 ha. During their dispersal phase, sub-adults between 6 and 12 months can have even larger home ranges (Monaco et al., 2003). Being so abundant and widespread, the species is currently not a subject of biodiversity conservation in Italy.

4.1.1 Legal framework of wild boar management and conservation

Wildlife conservation and management is ruled by the Italian national law n. 157 of February 11, 1992 (Toso and Pedrotti, 2001). While this legal framework establishes that wildlife species need to be protected to survive in the long term in nature, it also determines which wildlife management and conservation strategies are allowed and which wild species can be hunted and when (Toso and Pedrotti, 2001). In the case of wild boar, this law establishes that the species can be hunted from October 1 to December 31 or from November 1 to January 31 (Toso and Pedrotti, 2001). In addition, it states that

when the species causes damages or represent a health risk for local communities, selected staff can reduce the species population density through selective culling outside the hunting season (Toso and Pedrotti, 2001). The law 157/92 also promotes the institution in each Italian geographical district (i.e. region, province) of specific legal frameworks for wildlife conservation and management (Toso and Pedrotti, 2001). At a regional level, Lazio has enacted the national law 157/92 through the regional law n.17 of May 2, 1995. Through this regional framework, Lazio establishes yearly a wild boar hunting plan (e.g., number of animals that can be killed, hunting calendar), and determines what kind of wild boar management strategies will be applied on its territory.

4.1.2 Wild boars, protected areas, and conflicts

In contrast to the rest of the Italian territory, protected areas are governed under the national legal framework n.394 of December 6, 1991 (Monaco et al., 2010). This law rules the establishment of protected areas, as well as the management of their flora and fauna. It also determines which types of human activities and development are allowed inside protected areas. For example, the 394/91 establishes that inside protected areas recreational hunting is not allowed. If wildlife is damaging natural environments or human belongings, then conservation authorities may apply management strategies (i.e., wildlife population control, compensation, preventive measures) to reduce such impacts. The different legal frameworks, as well as the wildlife management and conservation approaches in force inside versus outside protected areas, are often the drivers of controversies over wildlife management in Italy.

Coherent and uniform laws and strategies to manage wild boar are lacking for the Italian territory (Carnevali et al., 2009). Specifically, different approaches are often undertaken inside and outside protected areas to deal with this species. For example, game managers tend to maximize wild boars population densities through repopulation activities outside protected areas for hunting purposes (Carnevali et al., 2009). Inside protected areas, however, conservation authorities have a mandate to manage wildlife that damages the natural environment, other species, and human economic activities. The law 394/1991 establishes that protected areas are responsible to repay, and/or provide preventive measures to people who have suffered wildlife damages inside a park (Monaco et al., 2010). Such management tools are often not sufficient to reduce the widespread economic and social impacts caused by wild boars in protected areas. Other strategies, such as selective culling of the species, are carried out to reduce the density of this overabundant ungulate inside parks. Since wild boar population control is often performed as a state task that does not involve the public, disagreements over species management arise between local communities and park authorities (Carnevali et al., 2009; Monaco et al., 2010). Controversies are exacerbated when decisions about a species are taken at a very high level (i.e., state level) and do not consider the interest of people living in and around the protected area. Conflicts over wild boars are not only a matter of the species' impact on other wildlife, the natural environment, and human economic activities, they are also a result of different interests and inconsistent wild boar management approaches carried out inside and outside protected areas (Monaco et al., 2010).

4.1.3 Wild boar management in protected areas of Lazio

The increase of direct and indirect impacts by wild boar on agricultural production and other human activities has resulted in species management focused on reducing economic damages and social conflicts (Toso and Pedrotti, 2001; Carnevali et al., 2009; Monaco et al., 2010). Programs to decrease the species population through captures and/or selective killing in and around protected areas have become common as a method of containing wild boar damages (Toso and Pedrotti, 2001; Carnevali et al., 2009; Monaco et al., 2010). In Lazio region, the complex issues concerning wild boar are the same as in the rest of Italy. As highlighted by the database of wildlife management in protected areas of the ARP agency (ARP, 2010), damages caused by wild boar to agricultural crops have increased (Figure 4.4). Compensation for the damage has become unsustainable throughout the protected areas all over Lazio region (Monaco et al., 2010). In seven protected areas of Lazio region, over 200,000 Euro has been paid to deal with wild boar impacts between 2000 and 2008 (Figure 4.5). In the last four years, 11% of the protected areas budget has been used to compensate Lazio farmers for wild boar damages to their crops.

Figure 4.4 Wild boar damages to agricultural crop in a protected area of Lazio region.

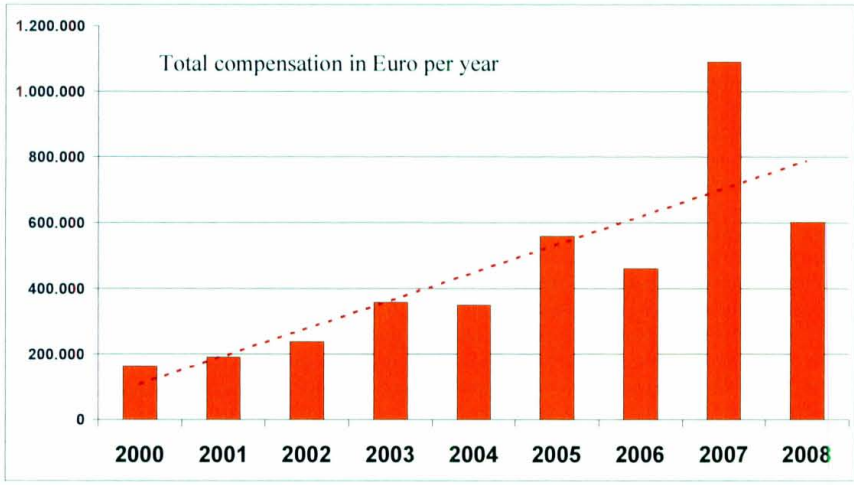

Figure 4.5 Total repayment of damages caused by wild boar in seven protected areas of Lazio Region between 2000 and 2008 (ARP, 2010). The dashed line highlights the exponential increase of compensation (in Euro) in seven protected areas of Lazio Region between 2000 and 2008.

To decrease the impact of wild boars, integrated management strategies, including preventive measures, compensation systems, and culls of problematic wildlife, have been applied inside protected areas (Monaco et al., 2003; Carnevali et al., 2009). For example, 102 wild boar have been captured and culled on average in each of four protected areas of Lazio region between 2002 and 2009 (Figure 4.6, 4.7 and 4.8). Despite the limited number of animals killed inside protected areas, conflicts between different interest groups have arisen over wild boar population control (e.g. park rangers versus hunters). While the species is recognized as a pest for agriculture, it is also highly appreciated as a game animal by hunters. Wild boar is hunted traditionally outside protected areas in drive hunts by big hunting teams with dogs (Scillitani et al., 2010); culling the species inside protected areas often results in local hunter opposition toward wild boar and protected areas management. Indeed, hunters perceive culling as a practice that reduces game for them, rather than a management tool that aims to reduce the ecological and economic impacts caused by a wild species. Different views held by interest groups have therefore resulted in the escalation of controversy over wild boar management in many protected areas of Lazio region.

Figure 4.6 Example of cage structure and food track applied inside protected areas of Lazio region for wild boar population control.

Figure 4.7 Adult wild boar captured during a population control session inside a protected area of Lazio region.

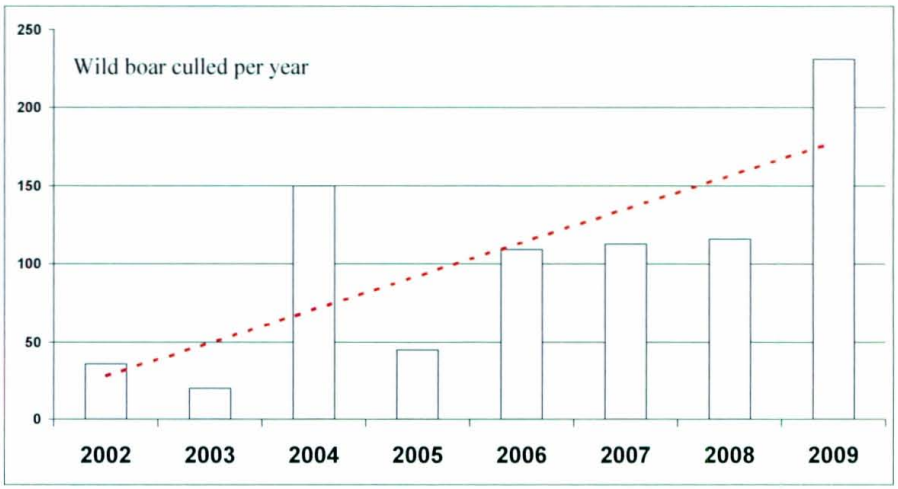

Figure 4.8 Total wild boar culled in four protected areas of Lazio Region between 2000 and 2009 (ARP, 2010). The dashed line highlights the exponential increase of wild boar culled in four protected areas of Lazio Region between 2000 and 2009.

To fully comprehend and manage human-wild boar conflicts in and around the protected areas of Lazio region, and to engage the public in wild boar management decision-making processes, a four-year (2007 to 2011) HD project was developed between the ARP and Memorial University (Canada). In an effort to be representative of the biophysical and cultural landscape of Lazio region and for implementation feasibility, two protected areas were selected in which to carry out research on wild boar: Circeo National Park and the RNR Nazzano-Tevere-Farfa (Figure 4.9).

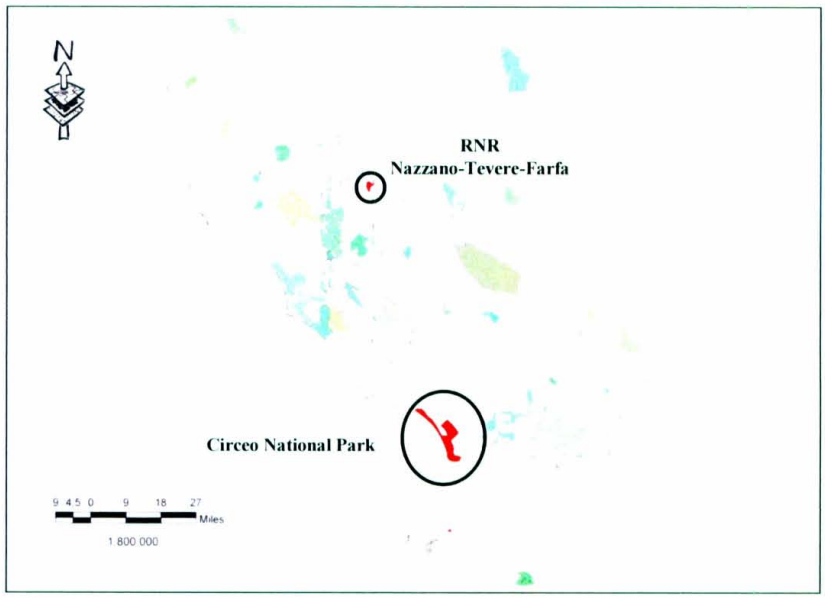

Figure 4.9 The location of Circeo National Park and the RNR Nazzano-Tevere-Farfa are shown in red on the map of the System of Protected Nature Areas of Lazio Region.

4.2 Circeo National Park

The Circeo National Park (category II of IUCN), with a surface of 8,500 ha and a 2 km buffer zone[1] around the protected area (Giagnacovo and Tomassini, 2003), is situated along the Tyrrhenian shores of southern Lazio, in the county borough of Latina (Figure 4.10 and 4.11). This national park was established in 1934 to preserve the remains of the

1 The buffer zone is an extension of the Circeo national park perimeter. It is mainly characterized by human modified landscapes, with less than 20% of the territory covered by natural habitats. This area is managed under the Italian national (n. 157/92) and regional legislation (n. 17/95) and not under the legal framework of protected areas (n. 394/91) (see paragraph 4.11 and 4.12). Specifically, different legal and management frameworks are in force inside Circeo national park and in the buffer zone. A detailed definition of the conservation purpose and economic development taking place in the buffer zone is currently missing. Thus, the limited information available for this area does not enable to better describe this area.

Pontine Marshes. Most national parks in Italy are centered on the high mountains of the Alps and of the Apennines; this protected area is one of the few that occupies a plain and a coastal area Lazio. It represents a remnant of the coastal wilderness that once covered the shores of the Italian peninsula (Zerunian, 2005). Along with remarkable archaeological remains, protects a rich group of natural habitats (Zerunian, 2005). It holds 3,300 ha of the relict lowland forest Selva di Terracina (Terracina wild forest). In addition, the protected area includes the promontory of Circeo, which is a biome characterized by Mediterranean maquis and 220 meters of coastal sand strip with dunes covered by maquis shrubland and short vegetation (Zerunian, 2005). This natural landscape is characterized by the presence of a unique flora composed of Continental (e.g., Turkish oak (*Quercus cerris*), Italian oak (*Quercus frainetto*), English oak (*Quercus robur*)) and Mediterranean vegetation (e.g., holly oak (*Quercus ilex*), cork oak (Quercus *suber*), stone pine (*Pinus Pinea*)) (Zerunian, 2005). This park has also four wetlands: the Paola, Caprolace, Monaci, and Fogliano coastal salt lakes. A part of the mainland territory, Circeo National Park includes the island of Zannone, a small inhabited island belonging to the Ponziano archipelago. The unique vegetation mosaic of sandy beaches, coastal lakes, wetlands, dunes, and lowland forest have favored the establishment of a rich fauna in the park (Zerunian, 2005). Of the 1,237 species present in this area, 250 are bird species; this protected area is positioned along one of the main migratory bird routes of Italy (Zerunian, 2005).

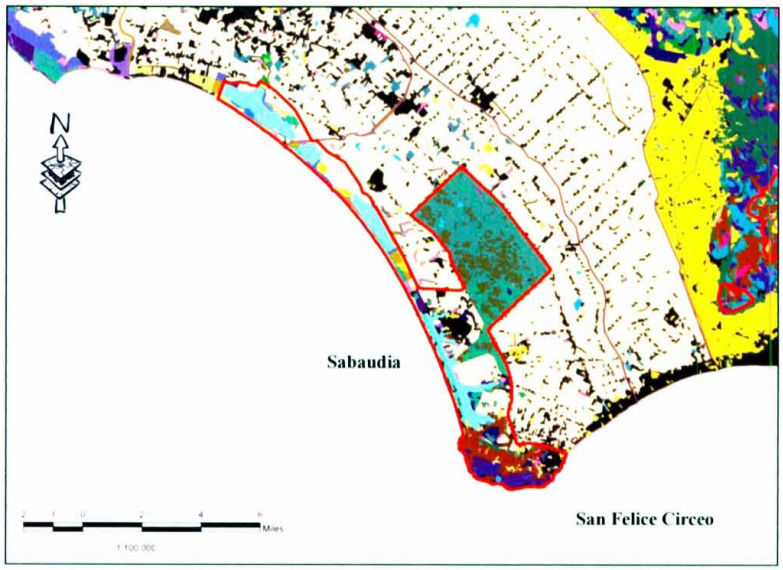

Figure 4.10 Map of Circeo National Park. The perimeter of the protected area is marked in red. In this map, blue is used for water basin, cream for agricultural land, black for human settlement, and brown for old growth forest. The two main villages inside the park, Sabaudia and San Felice Circeo, are also shown on the map.

Figure 4.11 Picture of Circeo National Park.

Established as the first national park in Lazio region for "conserving, preserving, increasing the value of the natural environment and fostering the development of tourism and sustainable practice," this protected area has undergone significant human modifications in the last eighty years (Zerunian, 2005). The draining of the original marshland in the 1920s and 1930s resulted in the loss of natural areas and an increase in human shaped landscape (Zerunian, 2005). Specifically, human settlements (11% of the park territory) have become an important feature of this national park (Giagnacovo and Tomassini, 2003). In 1927, there were just 937 inhabitants of the buffer zone and inside this protected area; today there is an estimated population of 149,842 (ISTAT, 2001; Zerunian, 2005). Sabaudia, with 17,171 residents, and San Felice Circeo, with 8,218 residents (ISTAT, 2001), are the major towns included inside the boundaries of this protected area. The agricultural landscape (18% of the park territory) has become a characterizing element of this national park over time (Giagnacovo and Tomassini, 2003). Currently, 11% of Circeo National Park territory is farmed with cereals and grass, another 5% is used as meadow for livestock grazing, and a further 2% is employed to grow vegetables, olives, and fruit (Giagnacovo and Tomassini, 2003). Around the park boundaries, including the buffer zone, 80% of the territory is agricultural land or human settlement. Agricultural activities play an important role in the economic development of this area. Indeed, such activities are mainly carried out for commercial purposes in and around this park.

4.3 Regional Nature Reserve Nazzano-Tevere-Farfa

The creation of a dam downstream of the confluence between the Tiber and the Farfa rivers in 1955 resulted in the flooding of the upper lands of the Farfa and the creation of a 300 ha "lake" (D'Antoni and Lugari, 2005). The importance of this artificial water basin was quickly recognized, and a protected oasis for the fauna was established in 1968. The growing significance of this wetland for migratory bird protection has resulted in the listing of this area under the Ramsar Convention[2] in 1977 (D'Antoni and Lugari, 2005). In 1979, this area received the designation of Regional Nature Reserve (RNR) Nazzano-Tevere-Farfa (category IV of IUCN) (D'Antoni and Lugari, 2005). Today, this protected area, situated between the county borough of Rieti and Rome, covers a surface of 707 ha, of which 111 ha are occupied by river bends, by the Nazzano Lake, and by the rivers Farfa and Tiber (Figure 4.12 and 4.13).

[2] The Ramsar convention identifies and develops an international network of wetlands to foster biodiversity conservation and sustainable use by maintaining wetlands ecosystem components, processes and benefits/services.

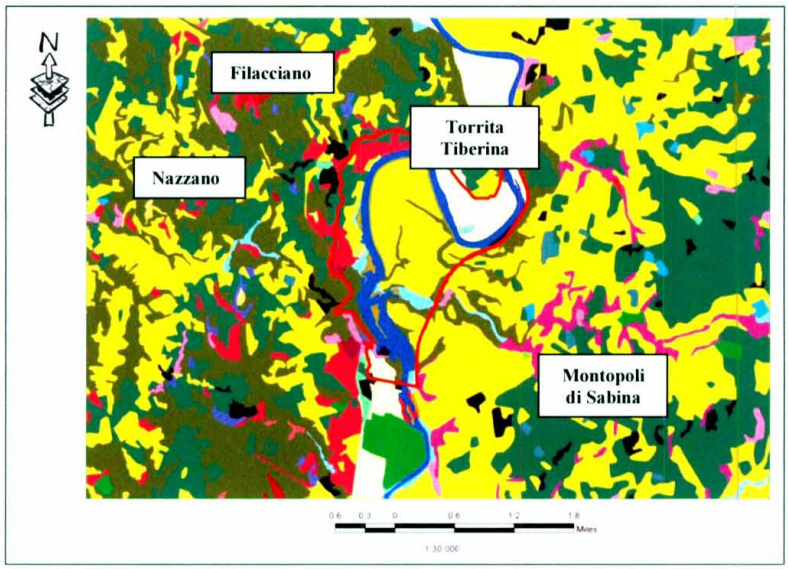

Figure 4.12 Map of RNR Nazzano-Tevere-Farfa. The perimeter of the protected area is outlined in red. In this map, blue is used for water basin, yellow for agricultural land, black for human settlement, and green for natural habitat. The three main villages around the park, Nazzano, Torrita Tiberina, Filacciano and Montopoli di Sabina, are also shown on the map.

Figure 4.13 Picture of RNR Nazzano-Tevere-Farfa.

The vegetation of this park is typical of wetland areas in Mediterranean climates (e.g., common reeds *(Phragmites australis),* creeping bent grass (*Agrostis stolonifera*), coastal small reeds (*Calamagrostis pseudophragmites)*) (D'Antoni and Lugari, 2005). Various kinds of forest are also present, ranging from Mediterranean forest (e.g., Turkish oak (*Quercus cerris*), holly oak (*Quercus ilex*), downy oak (*Quercus pubescens*)) to riparian woods (e.g., white poplar (*Populus alba)*, black poplar (*Populus nigra),* scarlet willows (*Salix alba)*) (D'Antoni and Lugari, 2005). In this reserve, 187 species of birds, nine species of amphibians, eleven species of reptile, and fourteen species of fish have been recorded (D'Antoni and Lugari, 2005). The incredibly high number of bird species for this area is due to the presence of a rich water bird community during the winter and the migration season (D'Antoni and Lugari, 2005).

More than 50% of the territory of the reserve is agricultural land (Gardini et al., 2007). Along the Tiber bends, the main crops are cereals and grass, such as wheat, clover, fodder and sunflower (Gardini et al., 2007). Such crops are mainly grown on plots of 6.4 ha on average and managed by small farm companies (Gardini et al., 2007). Subsistence farming is also carried out in the reserve territory. Vegetable gardens, olive groves, and orchards of 0.3 ha on average are indeed common inside this area (Gardini et al., 2007). Unlike Circeo National Park, no residents live in the boundaries of RNR Nazzano-Tevere-Farfa. Yet this reserve is surrounded by dense human settlements, such as the villages of Nazzano (1,251 residents), Torrita Tiberina (932 residents), Filacciano (502 residents) and Montopoli di Sabina (4,242 residents) (ISTAT, 2004).

4.4 Wild boars and the two protected areas: a case study approach

Circeo National Park and the RNR Nazzano-Tevere-Farfa are located within an agricultural landscape, and negative human attitudes toward wild boar are increasing as a consequence of economic damages caused by the species. The severity of the impacts caused by wild boar on agricultural land, however, varies significantly between the two areas. In Circeo National Park, the estimated population of wild boar is between nine and eleven individuals per 100 ha (Amici & Serrani, 2004). Wild boar population control has been carried out in this area since 1990. In addition, 56% of the territory of this national park is covered by wooded area rich in natural food sources (i.e., acorn, chestnuts, pine kernels) for wild boars. Only 18% of this protected area is covered by agricultural land. Thus, in Circeo National Park, damages to agriculture are less extreme than in other protected areas of Lazio. This is not the case in the RNR Nazzano-Tevere-Farfa. In this area there are fifteen individuals of wild boar per 100 ha (ARP, 2010). In 2006 this reserve started wild boar population control to reduce damages on the natural environments and human activities inside the park. Despite the reduction of the wild boar population density inside the reserve, this wetland is still experiencing increasing damages to agriculture. The elevated number of wild boar, the small extension of protected territory not covered by water, and the limited availability of natural food sources for wild boar are the main causes of this phenomenon. Growing impacts on wheat, clover, fodder, and sunflower are not only due to wild boar feeding on crops, but also caused by the species rooting and stomping on valuable agricultural land in and around the reserve (Gardini et al., 2007). Currently, this wetland accounts for the highest

incidence of wild boar impacts in the Lazio region: 17% of the reserve budget has been used to compensate wild boar damages to agriculture in the last four years (ARP, 2010). It is therefore assumed that perceptions toward wild boar in these two case study areas lie in different places on the conflict-coexistence continuum, representing ideal locations from which to investigate different degrees of conflict and coexistence. Furthermore, a better understanding of the complex issues facing wild boar management in these two protected areas will enable ARP to identify and apply the best practice acquired during the HD project to other protected areas of Lazio region and in Italy.

5. Method

5.1 Data collection

In this study, the appropriate strata and sample size for the two communities within Circeo National Park and the three of RNR Nazzano-Tever-Farfa were calculated from the most recent national census (ISTAT, 2001). For Circeo National Park, the sample population was 25,389 people, and for RNR Nazzano-Tever-Farfa it was 6,927 people (Figure 5.1). To ensure that sampling was completed in proportion to the population of the study areas (Sheskin, 1985; Hall and Hall, 1996; Vaske, 2008; Warner, 2008), the grid system of the cartography provided by the ARP was used to divide both protected areas into smaller zones. Due to the buffer zone around Circeo National Park, this area was first divided inside and outside of the protected area. A further subdivision of these two zones ensured the number of participants from the two villages present in the study area, Sabaudia and San Felice Circeo, were investigated proportional to their respective population (Table. 5.1).

Because Circeo National Park is situated along a coastal zone, many houses in these study areas are holiday homes; many of the people registered as residents actually live in Rome or Naples. Therefore, the number of residents reported in the census data did not correspond to the effective population living in Sabaudia and San Felice Circeo. To capture the social context of Circeo National Park, both residents and non-residents participated in this study. Only the non-residents who had a vacation home in the area were interviewed, as it was considered that they might be willing to engage in wild boar

management in the park due to first-hand experience with the species (e.g., receiving damages to their properties, viewing wild boar). To avoid collecting data from individuals with limited interest in the wild boar issue, non-residents who spent only their vacation in Circeo National Park were not considered in this study As a result, a slightly different number of interviews were obtained for both villages than was expected (Table 5.1). Since there are no residents inside the RNR Nazzano-Tevere-Farfa, data collection was carried out outside of the protected area. Once again, the map grid system was used to define the main communities present in the study area. The villages of Filacciano, Torrita Tiberina, and Nazzano were investigated due to their proximity to the reserve; a proportional sample of residents was drawn from each (Table 5.2). For Nazzano, the number of effective interviews exceeded expectations due to the higher concentration of individuals belonging to interest groups (e.g. hunters, farmers) living in the village (Table 5.2). Additional interviews were collected from these interest groups during facilitated workshops. Data collected through stratified random sampling were implemented with those obtained during the workshops only in this case. In addition, the area of Montopoli di Sabina was included, as it may be involved in a possible expansion of the reserve. Due to the vastness of this territory, only the area of possible reserve expansion was included for data collection; the expected 276 interviews were reduced to 198 to be representative of the section of the territory located between the reserve boundary and the village of Montopoli di Sabina. The number of planned interviews was recalculated based on the data provided by the RNR Nazzano-Tevere-Farfa. Residency, age, and sex were used to define the target population in both areas (Sheskin, 1985; Hall and Hall, 1996; Vaske, 2008; Warner, 2008). Following the categories of the national census, residents were

divided into three age groups: younger (20 to 39), middle-aged (40 to 64), and senior (65 and over). The expected female-male ratio was 50%:50% (ISTAT, 2001).

Table 5.1. Sampling frame for Circeo National Park

Communities	Resident	Expected	Inside Interviewed	Outside Interviewed	Total
San Felice Circeo	17,171	541	245	340	585
Sabaudia	8,218	259	154	62	216
Total	25,389	800	399	402	801

Table 5.2 Sampling frame for RNR Nazzano-Tevere-Farfa

Communities	Resident	Expected	Interviewed
Nazzano	1,251	82	117
Torrita Tiberina	932	61	63
Filacciano	502	73	73
Montopoli di Sabina	4,242	276	198
Total	6,927	452	452

To obtain a community sample that best represented the entire population of the study zones, a stratified random sampling was applied (Sheskin, 1985; Hall and Hall, 1996; Vaske, 2008; Warner, 2008)., The population of each area was divided into distinct and independent strata; each stratum was then sampled as an independent sub-population to ensure that the representation of groups in the sample was the same as in the population of each study zone. Four hundred participants were interviewed per survey zone in each study area (Sheskin, 1985). A sample size of 400 is standard to allow for results to be accurate 19 times out of 20, plus or minus five percentage points (Sheskin, 1985). This sample generates results with a confidence level of 95% and a confidence interval of 5%, an acceptable standard in social science research (Sheskin, 1985; Vaske, 2008). Due to the division of Circeo National Park into a protected area and a buffer zone, a total of 801 face-to-face interviews were carried out in this study area. After

checking for outliers, only 792 completed questionnaires were appropriate to use for data analysis. In the RNR Nazzano-Tevere-Farfa, 452 face-to-face interviews were carried out in the buffer zone of the park; all of them were suitable for data analysis. An extra 52 interviews were carried out in this second study area to engage interest groups in wild boar management. For each zone in the two study areas, the number of questionnaires needed was calculated by dividing the population numbers for the community by the total population living in the study area. The number obtained was than multiplied by the number of questionnaires planned for the area.

The questionnaire was administered as a personal structured interview at the respondent's home. The process of participant selection was simple: the first adult of 18 years or older contacted in the household was asked the questions. In this way, occasional users of both parks, such as tourists, were excluded from the study sample. Individuals with limited exposure to and interest in wild boar issues, or people not interested in participating in wildlife decision-making processes in the study areas, were excluded from the sample population. Although almost all the interviews were carried out at the respondent's home, a few individuals were interviewed using a street-intercept method to help characterize the communities living in and around the two protected areas (Miller et al., 1997). The application of these two data collection methods enabled the gathering of data that corresponded to the age and sex categories reported on the national census.

Depending upon the level of interest of participants, the length of the interview varied from 15 to 30 minutes. However, most interviews were completed within 15 minutes. Data entry for both study areas was carried out during data collection. Quality

control and checking procedures were applied while coding and preparing data for analysis. No relevant problems were detected with these examination techniques.

To collect information and understand public attitudes toward wildlife, a quantitative approach was applied for this study (Siemer et al., 2001; Fowler, 2002). Two similar questionnaires were specifically designed for the two study areas by using information provided by the ARP. In addition, previous HD studies carried out in Europe (Bath 2000, Bath and Majic 2001; Kaczensky et al., 2004) were considered while designing the questionnaire. Both questionnaires were composed of 66 items and focused on the following key components: attitudes, beliefs, knowledge, and support and opposition toward possible management options about wild boar. Socio-demographic characteristics of the participants were gathered as well. The questionnaire used in Circeo National Park in the spring/summer of 2008 (Appendix I) was adapted and modified for data collection in the RNR Nazzano-Tevere-Farfa in the spring/summer of 2009-2010 (Appendix II). New questions were designed for RNR Nazzano-Tevere-Farfa to better represent people's perceptions toward wild boar in this study area. Such changes focused primarily on wild boar management as this protected area is experiencing an incredibly high level of wild boar impacts (e.g., Appendix II, Part D, question 4). Furthermore, based on the knowledge acquired carrying out data collection in the first study area, the questionnaire was reformatted and some items were redesigned (e.g. Appendix I, Part A, question 15 versus Appendix II, Part A, question 7) or eliminated (e.g. Appendix I, Part A, question 1) to help respondents better answer the questionnaire in RNR Nazzano-Tevere-Farfa. Both questionnaires were sent to experts (i.e., wild boar biologists, HD

researchers) for content and wording consultation and a pre-test of the questionnaire was completed to reduce the likelihood that participants would misunderstand or not answer the questionnaire items. The wording and flow check was also carried out to make sure the questions were appropriate in content and properly designed for each study area. Before carrying out the research, ethical approval was obtained from Memorial University and the Regional Park Agency Lazio. To reduce possible biases, most of the items were close-ended and the researcher herself conducted all the interviews.

Face-to-face interviews were considered the most suitable instrument for collecting quantitative data in a southern European context (Bath and Majic, 2001; Espirito-Santo, 2007), where building trust through personal contact plays a fundamental role in dealing with controversial topics such as wildlife management. This data collection approach enables the researcher to include complex themes, such as the conflict-coexistence continuum, and to clarify specific questions. It also results in a high response and item completion rate (Holbrooket al., 2008). By administering the interview personally to participants, the researcher is also able to observe behaviour and collect additional insights into the issue being explored. Such qualitative information assisted the understanding of the socio-cultural context in which respondents lived and enabled to better interpret data obtained through the quantitative approach.

5.2 Data analysis

This subsection presents a short overview of the statistical methods applied to explore the overarching goal and the three objectives of this dissertation. The statistics

used to investigate the point at which conflict with wildlife becomes minimized enough that coexistence begins are outlined for the three papers. While Stevens (1951) associates parametric statistics (i.e. samples compared are normally distributed) with interval and ratio scales and nonparametric ones (i.e., samples compared are not normally distributed) with nominal and ordinal scales, Vaske (2008) classifies measurements as dichotomous (i.e., variables with only two responses), categorical (variables with more than two responses) and continuous (i.e., variables with a set of responses that are approximately normally distributed). Vaske's (2008) levels of measurements not only enable a better selection of statistics and interpretation of data from human dimension surveys, they also overcome issues related to the selection of analysis based on the distribution of the sample compared (i.e., parametric versus nonparametric). As Vaske (2008) highlights, the only prerequisite for using parametric statistics based on levels of measurements is that the mathematical assumption underlying the procedure is met. Thus, the level of measurement is not a requirement for the use of parametric statistics. Furthermore, "parametric procedures are robust and yield valid conclusions even when data are distorted (i.e., not normally distributed)" (Vaske, 2008, p. 85). To select statistical procedures and analysis that include both parametric and nonparametric tests, Vaske's (2008) levels of measurements were applied in this manuscript. For the articles in this thesis, all statistics were carried out with the software SPSS version 17 (SPSS, 2008) and a significance level of $p<0.05$ was selected (Fowler et al., 1998; Vaske, 2008).

In the first article of the dissertation, a five-point Likert-type rating scale and a continuous rating scale were compared to better understand item format variability and

reliability. For Circeo National Park and the RNR Nazzano-Tevere-Farfa, means, standard deviations, and coefficients of variation of a five-point rating scale and of a continuous rating scale were explored. The Wilcoxon statistic for paired ordinal variables was applied to determine whether participants expressed their opinions about wild boar in the same way across rating scale formats (Fowler et al., 1998; Warner, 2008). The relative reliability of the two response options was explored by computing a Spearman rank order correlation coefficient between the two rating scales (Warner, 2008; Vaske, 2008). For this analysis, correlation coefficients were considered high when $r \geq 0.7$, modest when between $0.69 \leq r \leq 0.4$, and low when $r \leq 0.39$ (Fowler et al., 1998). To take possible sample size effects into account, Eta measures were reported. Effect size was considered a minimal relationship when $\eta \geq 0.10$, a typical relationship when $\eta \geq 0.243$, and a substantial relationship when $\eta \geq 0.371$ (Vaske, 2008).

In the second paper, the protected area boundary effect was explored to understand if the location in which wild boar are encountered plays a role in shaping tolerance and thus coexistence with wildlife. To investigate if people living inside or outside Circeo National Park perceive wild boar differently, exploratory statistics (i.e mean, standard deviation), an independent sample t-test and an exploratory factor analysis with a Varimax Kaiser Normalization rotation were carried out on the items concerning wild boar management. All statistical tests were two-tailed. The scree plot and eigenvalue scores of the principal component analysis from the maximum likelihood extraction (about equal to or greater than 1) were used to extrapolate factors accounting for the variance. For better interpretation of the individual components, those loadings below

0.30 were omitted from further analysis (Tabachnick and Fidell, 2001). For this analysis, the sample size effect was estimated through Cohen's d effect and considered minimal when $d \leq 0.2$, typical when $0.21 \leq d \leq 0.79$, and substantial when $d \geq 0.80$ (Vaske 2008).

In the third paper, underlying conflicts between the general public, interest groups, and park managers are explored to identify the reasons behind human-wildlife conflicts in wild boar management in Lazio region. To examine if differences in attitudes exist between groups, descriptive statistics (i.e. mean, standard deviation) and a Chi-square were performed. Cramer's V, a common chi-square-based measure of association, was reported for each comparison to take into account the possible effect of sample size (Vaske, 2008). This index was considered an appropriate effect size measure for this article since an association between two categorical variables with more than two levels was performed (Vaske, 2008). Cramer's V was considered as a "minimal" relationship with values of 0.1, as a "typical" relationship with values of 0.30, and as a "substantial" relationship with values of 0.50 and over (Vaske, 2008). Groups with statistically significant differences in attitudes toward wild boar management options were further investigated with the Potential for Conflict Index (PCI) (Manfredo et al., 2003; Vaske et al., 2006; Vaske, 2008). The values for the PCI range from 0 to 1, where 0 indicates no conflict and 1 indicates maximum conflict. The mean, or central tendency distribution of the data, is also considered to evaluate if a specific action is supported or opposed by the public (Vaske et al., 2006; Vaske, 2008). This visual approach enables researchers to facilitate the understanding and applicability of human dimension findings using a graphic technique.

6. References Introduction

Amici A. and Serrani F. (2004). *Linee guida per la gestione del cinghiale (Sus scrofa) nella Provincia di Viterbo*. Università della Tuscia, Dipartimento di Produzioni Animali - Provincia di Viterba, Assessorato Agricoltura, Caccia e Pesca.

Anderson, S.H., Beiswenger, R.E. and P.W. Purdom (1987). *Environmental Science*, 4th Ed. Prentice Hall, NJ. 488pp.

Anderson, K. (1997). A walk on the wild side: a critical geography of domestication. *Progress in Human Geography* 21: 463–485.

Apollonio M., Randi E. and Toso, S. (1988). The systematics of the wild boar (Sus scrofa L.) in Italy. *Bollettino di Zoologia* 3: 213-221.

ARP (2011). http://www.arplazio.it/

ARP (2010). Database on wildlife management in protected areas of Lazio region. Unpublished raw data of the Regional Park Agency Lazio.

ARP Lazio, (2003). Osservatorio per la Biodiversità del Lazio.http://www.leps.it/obl/

Bangs, E. and Shivik, J. (2001). Managing wolf conflict with livestock in the Northwestern United States. *Carnivore Damage Prevention News* 3: 2-5.

Bath, A.J. (1996). Increasing the applicability of human dimensions research to large predators. *Journal of Wildlife Research* 1: 215-220.

Bath, A.J. (2000). *Human Dimensions in wolf management in Savoie and Des Alpes Maritimes, France: results targeted toward designing a more effective communication campaign and building better public awareness materials*. LIFE -

Nature Project Du Loup Dans Les Alpes Françaises and the LCIE - Large Carnivore Initiative for Europe Available at www.lcie.org

Bath, A.J. and Buchanan, T. (1989). Attitudes of interest groups in Wyoming towards wolf restoration in Yellowstone National Park. *Wildlife Society Bulletin* 17: 519-525.

Bath A.J. and Majic A. (2001). *Human Dimensions in Wolf Management in Croatia: Understanding Attitudes and Beliefs of Residents in Gorski Kotar, Lika and Dalmatia toward Wolves and Wolf Management*. LCIE - Large Carnivore Initiative for Europe.

Bath, A.J. and Enck, J.W. (2003). Wildlife-Human interactions in National Parks in Canada and the USA. *NPS Social Science Research Review VI* 1: 1-32.

Barlow, A. C. D., Greenwood C. J., Ahmad I., U. and Smith, J.L. (2010). Use of an action-selection framework for human-carnivore conflict in the Bangladesh Sundarbans. *Conservation Biology*, 24(5): 1338-1347.

Bird, E.A.R. (1987). The social construction of nature: theoretical approaches to the history of environmental problems. Environmental Review 11: 255–264.

Binnema, T. and Niemi, M. (2006). Let the Line Be Drawn Now': Wilderness, conservation, and the exclusion of aboriginal people from Banff National Park. *Environmental History*11 (4): 724-750.

Blanchard, K.A. (2000). Rachel Carson and the human dimensions of fish and wildlife management. *Human Dimensions of Wildlife* 5: 52- 66.

Breitenmoser, U., Angst, C., Landry, J., Breitenmoser-Wursten, C., Linnell, J. D.C., & Weber, J. (2005). Non-lethal techniques for reducing depredation.(p.49-71) In

Woodroffe, R., Thirgood S. and Rabinowitz, A. (2005). *People and Wildlife: Conflict or coexistence?* Cambridge University Press, Cambridge, UK.

Bright, A.D. and Manfredo, M.J. (1995). The quality of attitudinal information regarding natural resource issues: the role of attitude-strength, importance, and information. *Society and Natural Resources* 8: 399-414.

Boitani L., Mattei L., Nonis D. and Corsi F., (1994). Spatial and activity patterns of wild boars in Tuscany, Italy. *Journal of Mammalogy*, 75(3): 600-612.

Boitani L., Trapanese P., Mattei L. and Nonis D. (1995). Demography of a wild boar (Sus scrofa, L.) population in Tuscany, Italy. *Gibier Faune Sauvage*, 12: 109-132.

Carnevali L. and Scacco M. (2009). *Indagine sull'atteggiamento della popolazione residente e non nei confronti del Cinghiale (Sus scrofa) nel Parco Regionale dei Colli Euganei Relazione tecnica n. 3.3*. Istituto Nazionale Fauna Selvatica.

Carnevali, L., Pedrotti, L., Riga, F. and Toso, S. (2009) *Ungulates in Italy: Status, distribution, abundance, management and hunting of Ungulate populations in Italy - Report 2001–2005. Biol Cons Fauna, 117*. Istituto Nazionale Fauna Selvatica.

Carson, R. (1962). *Silent Spring*. Houghton Mifflin, New York.

Cassier, E. (1963). *The individual and the cosmos in renaissance philosophy*. English. University of Chicago Press. Harper Collins. Publisher USA.

Choudhury, A. (2004). Human-elephant conflicts in Northeast India. *Human Dimension of Wildlife* 9: 261-270.

Christ, T. J. and Boice, C. (2009). Rating scale items. A brief review of nomenclature, components, and formatting to inform the development of Direct Behavior Rating (DBR). *Assessment for Effective Intervention* 34, 242-250.

Clark, T. W., Rutherford, M. B. and Casey, D. (2005). *Coexisting with large carnivores. Lessons from Greater Yellowstone*. Island Press, Washington, DC.

Clayton, S. and Opotow, S. (2003). *Identity and the Natural Environment*. The MIT Press. London, UK.

Conover, M. R. (1998). Perceptions of American agricultural producers about wildlife on their farms and ranches. *Wildlife Society Bulletin* 26: 597-604.

Conover, M. R., Pitt, W. C., Kessler, K. K. DuBow, T. J., & Sanborn, W. A. (1995). Review of human injuries, illnesses, and economic losses caused by wildlife in the United States. *Wildlife Society Bulletin* 23:407-414.

Creager, A. N. H. and Jordan, W. C. (2002). *The Animal/Human Boundary: Historical Perspectives (Studies in Comparative History)*. University of Rochester Press. UK.

Cronon, W. (1995). "The Trouble With Wilderness; Getting Back to the Wrong Nature". *Environmental History* 1: 7-28.

D'Antoni, S. and Lugari, A. (2005). *Guida ai servizi delle aree naturali protette del Lazio. Riserva Natirale Nazzano-Tevere-Farfa*. Beta Tipografica s.r.l., Italy.

Darwin, C. R. (1859). *On the origin of species by means of natural selection, or the preservation of favoured races in the struggle for life*. London: John Murray. [1st edition]

Decker, D.J., Brown, T.L., & Mattfeld, G.F. (1987). Integrating social science into wildlife management: barriers and limitations. pp. 83-92. In Miller, M.L., Gale, R.P., & Brown, P.J. (Eds) *Social Science in Natural Resource Management Systems*. Westview Press: Boulder, Colorado, U.S.A.

Decker, D.J., Brown T.L. and Siemer, W.F. (2001). *Human Dimensions of Wildlife Management in North America*. The Wildlife Society. Bethesda; Maryland

Delacroix L., Mauget R. and Signoret J. P., (1990). Existence of synchronization of reproduction at the level of social group of the European wild boar. *Journal of Reproduction and Fertility*, 89: 613-617

Distefano, E. (2005) *Human-Wildlife Conflict Worldwide: A collection of case studies, analysis of management strategies and good practices*. SARD Initiative Report, FAO, Rome.

Eagles, P. F.J., McCool, S.F. and Haynes, C. D.A. (2002). *Sustainable Tourism in Protected Areas: Guidelines for Planning and Management*. IUCN Gland, Switzerland and Cambridge, UK. xv + 183pp

Erlich, P. R. (1968). *The Population Bomb*. New York: Ballantine Books.

Emel, J, C. W. and Wolch, J. (2002). *Animal Geographies*. Society & Animals: 10:4.

Enck, J. W., Decker, D. J., Riley, S. J., Organ, J. F., Carpenter, L. H., & Siemer, W. F. (2006). Integrating ecological and human dimensions in adaptive management of wildlife-related impacts. *Wildlife Society Bulletin* 34:698–705

Ericsson, G., Heberlein, T.A., Karlosson, J., Bjärvall, A. and Lundvall, A. (2004). Support for hunting as a means of wolf Canis lupus population control in Sweden. *Wildlife Biology* 10: 269–276.

Espírito-Santo, C., (2007). *Human dimensions in Iberian wolf management in Portugal: attitudes and beliefs of interest groups and the public toward a fragmented wolf population*. Master Thesis, Memorial University of Newfoundland, St. John's, Canada.

Evernden, N. (1992). *The Social Creation of Nature*. Johns Hopkins University Press, Baltimore.

Fitzsimmons, M. (1989). The Matter of Nature. *Antipode*, 21: 106-120.

Flader, S. L. (1994). *Thinking like a mountain: Aldo Leopold and the evolution of an ecological attitude toward deer, wolves, and forests*. University of Wisconsin Press. Madison, Wisconsin.

Fowler F.J. (2002). *Survey Research Methods*. (3rd ed.) (Vol. 1) Sage Publications, Inc.

Fowler, F. J., Choen, L., & Jarvis, P. (1998). *Practical Statistics for Field Biology*. Second Edition. John Wiley & Sons Ltd. West Sussex, England.

Frassanito A. G. (2005). *Verso la gestione partecipativa della problematica cinghiale nel Parco Nazionale del Gargano*. Master thesis. Facoltà di Scienze Matematiche Fisiche e Naturali Dipartimento di Biologia Animale e dell'Uomo, Univesità degli Studi di Roma La Sapienza.

Fulton, D.C., Manfredo, M.J. and Lipscomb, J. (1996). Wildlife value orientations: a conceptual and measurement approach. *Human Dimension of Wildlife* 1: 24-47.

Giagnacovo, G. and Tomassini, A. (2003). Realizzazione della Carta dell'Uso del Suolo del Parco Nazionale del Circeo e Aree Limitrofe. Progetto "Parchi in qualità" ovvero "applicazione pilota del Sistema di Gestione Ambientale nelle aree naturali protette". Accordo di programma Ministero dell'Ambiente e del Territorio ed ENEA.

Giardini, L., Baldi, A. and Calò, C. M. (2007). Monitoraggio del cinghiale (Sus scrofa) nella riserva natural regionale Tevere-Farfa. Rapporto finale. Riserva Naturale Regionale Tevere–Farfa, Ottobre: 60.

Gillighm, S. and Lee, P.C. (2003). People and protected areas: a study of local perceptions of wildlife crop-damage in an area bordering the Selous Game Reserve, Tanzania. *Oryx* 37: 316-325.

Glikman, J. A. and Frank, B. (2011). Human dimensions of wildlife in Europe: the Italian way. *Human Dimension of Wildlife* 16 (5): 368-377.

Grant, J.A., and Quinn, M.S. (2007). Factors influencing transboundary wildlife management in the North American 'Crown of the Continent'. Environmental *Planning and Management* 50: 765 – 782.

Gore, M. L., Siemer, W. F., Shanahan, J. E., Schuefele, D. and Decker D. J. (2005). Effects on risk perception of media coverage of a black bear-related human fatality. *Wildlife Society Bulletin* 33: 507-516.

Gore, M.L., Knuth, B. A., Curtis P. D. and Shanahan, J. E. (2007). Campground manager and user perceptions of risk associated with negative human-black bear interactions. *Human Dimension of Wildlife* 12: 31-43.

Groom, M.G., Meffe, G.K., Carroll, C.R. and contributors (2006). *Principles of Conservation Biology (3rd edition)*. Sinauer. Sunderland, MA.

Hall, D. and Hall, I. (1996). *Practical Social Research: project work in the community*. Macmillan Press LTD, Malaysia

Hardin, G. (1968). *The tragedy of the commons*. Science, 162: 1243-1248.

Holbrook, A.L., Green, M.C. and Krosnick, J.A. (2003). Telephone versus face-to-face interviewing of national probability samples with long questionnaires. *Public Opinion Quarterly* 67: 79-125.

Hudenko-Wieczorek H. and Decker, D. (2008). *Perspectives on Human Dimensions of Wildlife Habituation.* Report from a workshop conducted at Human Dimensions of Fish and Wildlife Management Conference. Estes Park, CO

Ingold, T. (1994). From trust to domination: An alternative history of human-animal relations, 1-22. In Manning, A. and Serpell, J. (Eds.), *Animals and human society*. Routledge, New York.

ISTAT, 2004. Rapporto annuale 2004. www.istat.it.

Jacoby, K. (2001). *Crimes against nature: squatters, poachers, thieves, and the hidden history of American conservation*. University of California Press. Berkeley, California.

Jacobson, S.K. and Duff M. D. (1998) Training Idiot Savants: The Lack of Human Dimensions in Conservation Biology. *Conservation Biology* 12(2): 263-267.

Jenkins, J. and Keal, A., (2004). *The Adirondack atlas.* Syracuse University Press.

Jentoft, S., and Chuenpagdee, R. (2009). Fisheries and coastal governance as a wicked problem. *Marine Policy* 33: 553-560.

Jentoft, S., Chuenpagdee, R., Bundy, A. and Mahon, R. (2010). Pyramids and roses: alternative images of the governance of fisheries systems. *Marine Policy* 34: 1315-1321.

Johansson, T. (2009). The Spatial Dimension of Human-Wildlife Conflicts - Discoveries of New Animal Geography, 257-265. In, Donert, K., Y. Ari, M. Attard, G. O'Reilly and Schmeinck D. (eds.): *Geographical Diversity*. Proceedings of the HERODOT Conference in Ayvalik, Turkey 28-31 May 2009. Geography in European higher education 9. The Herodot Thematic Network, MBVBerlin, Germany.

Johansson, T. (2008). *Beasts on Fields. Human-Wildlife Conflict in Nature-Culture Borderlands*. Academic dissertation. Helsingin Yliopiston maantieteen laitoksen julkaisuja A145. Department of Geography, University of Helsinki. Hansaprint, Helsink.

Kaczensky, P. (1999). Large carnivore predation on livestock in Europe. *Ursus* 11: 59-72.

Kaczensky, P., Blazic, M. and Gossow, H. (2004). Public attitudes towards brown bears (*Ursus arctos*) in Slovenia. *Biological Conservation* 118: 661-674.

Kaltenborn, B. P., Bjerke, T. and Nyahongo, J. (2006). Living with problem animals-self-reported fear of potentially dangerous species in the Serengeti region, Tanzania. *Human Dimension of Wildlife* 11: 397-409.

Kellert, S.R. (2000). Values, ethics, and spiritual and scientific relations to nature (pp. 49-64). IN: Kellert, S.R. and Farnham, T.J. (Editors). *The Good in Nature and Humanity: Connecting Science, Religion, and Spirituality with the Natural World.* Island Press. Washington, DC:

Knight, J. (2000). Introduction, 1-35. *Natural enemies. People-wildlife conflicts in anthropological perspective*. Routledge, London, UK.

Knight, R. L. Z & Riedel, S. (2002). *Aldo Leopold and the Ecological Conscience*. New York: Oxford University Press.

Kruuk, H. (2002). *History of a conflict: carnivores and the first hominids, 103-115. In Huntar and Huntead.* Cambridge University Press, Cambridge, UK.

Lange, F. and Söderlund, M. (2004). *Response formats in questionnaires: Itemized rating scales versus continuous rating scales*. SSE/EFI Working Paper Series in Business Administration, No. 2004, 13.

Lauber, B.T. and Knuth, B.A., (2004). Effects of information on attitudes toward suburban deer management. *Wildlife Society Bulletin* 32: 322-331.

Lynn, W. S. (1998). Animals, ethic and geography, 280-297. In Wolch, J. and Emel, J. *Animal Geographies. Places, politics, and identity in the nature-culture borderlands*. Verso, London, UK.

Madden, F. (2004a). Creating coexistence between humans and wildlife: global perspectives on local efforts to address human-wildlife conflict. *Human Dimensions of Wildlife* 9: 247-257.

Madden, F. (2004b). Can traditions of tolerance help minimize conflict? An exploration of cultural factors supporting human-wildlife coexistence. *Policy Matters* 13: 234-241.

Manfredo, M.J. (2008). *Who Cares About Wildlife?* Social Science Concepts for Exploring Human-Wildlife Relationships and Conservation Issues. The nature of human values. New York, Free Press.

Manfredo., M., J., Decker, D., J. & Duda, M., D. (1998). *What is the future of human dimensions of wildlife?* Trans. 63rd North American Wildlife and Natural Resource Conference.

Manfredo, M. J., Vaske, J. J. and Teel, T. L. (2003). The potential for conflict index: a graphic approach to practical significance of human dimensions research. *Human Dimensions of Wildlife* 8:219–228.

Manfredo, M. and Daye, A. (2004). Concepts for Exploring the Social Aspects of Human-Wildlife Conflict in a Global Context. *Human Dimensions of Wildlife* 9: 1-20.

Manfredo, M.J., Vaske, J.J., Brown, P.J., Decker, D.J. and Dike, E.A. (2009). *Wildlife and society: the science of human dimensions*. Island Press, Washington, DC.

Mannigel, E. (2008). Integrating Parks and People: How Does Participation Work in Protected Area Management? *Society & Natural Resources* 21: 498 – 511.

Manning, A. and Serpell, J. (1994). *Animals and human society*. Routledge, New York

Mascia, B. M., Brosius, J. P., Dobson, T.A., Forbes, B. C., Horowitz, L., Mc Kean, M. A. and Turner, N. J. (2003). Conservation and the Social Sciences. *Conservation Biology* 17: 649-650.

Massei G., Genov P. V. and Staines B. W. (1996). Diet, food availability and reproduction of wild boar in a Mediterranean coastal area. *Acta Theriologica,* 41(3): 307-320.

Massei G., Genov P. V., Staines B. W. and Gorman M. L., (1997). Factors influencing home range and activity of wild boar (Sus scrofa) in a Mediterranean coastal area. *Journal of Zoology*, 242: 411-423

Massei G. and Genov P. V. (2004) The environmental impact of wild boar. *Galemys* 16: 135-145.

Massei G., Sugoto R. and Bunting R. (2011) Too many hogs? A review of methods to mitigate impact by wild boar and feral hogs. *Human Wildlife Interaction* 5(1):79–99.

McLain, R.J. and Lee, R.G. (1996). Adaptive management: promises and pitfalls. *Environmental Management* 20(4): 437-448.

McNamee, T. (1997). *The return of the wolf to Yellowstone*. Henry Holt and Company. New York.

Mech, L.D. (2001). Managing Minnesota's recovered wolves. *Wildlife Society Bulletin 29*: 70-77.

Messmer, T. A. (2000). The emergence of human-wildlife conflict management: turning challenges into opportunities. *International Biodeterioration and Biodegradation* 45: 97-102.

Messmer, T. A. (2009). Huma-wildlife conflicts: emerging challenges and opportunities. *Human-Wildlife Conflicts* 3: 10-17.

Miller, K.W., (2009). Human dimensions of wildlife population management in Australasia – history, approaches and directions. *Wildlife Research* 36: 48–56.

Miller, K.W., Wilder, L.B., Stillman, F.A. and Becker, D.M. (1997). The feasibility of a street-intercept survey method in an African-American Community. *American Journal of Public Health*, 87: 655-658.

Miller, C.A., Campbell, L.K. and Yeagle, J. A. (2000). *Attitudes of Homeowners in the Greater Chicago Metropolitan Region Toward Nuisance Wildlife*. Job Completion Report, Federal Aid in Wildlife Restoration W-112-R-10. Human Dimensions Program Report SR-00-02. Illinois Natural History Survey, Champaign, IL.

Mitchell, B., (2002). *Resource and Environmental Management*. Bruce Mitchell, 2nd ed. Harlow: Pearson Education Limited.

Monaco A., Franzetti B., Pedrotti L. and Toso, S. (2003). *Linee guida per la gestione del cinghiale*. Ministero Politiche Agricole e Forestali-I.N.F.S.

Monaco A., Carnevali, L. and Toso, S. (2010). *Linee guida per la gestione del cinghiale (Sus Scrofa) nelle aree protette. 2ª edizione*. Quaderni Cinservazione della natura, 34. Ministero ambiente-I.S.P.R.A.

Moretti M., (1995). Birth distribution, structure and dynamics of a hunted mountain population of wild boars (Sus scrofa L.), Ticino, Switzerland. *Ibex J. M. E.* 3:192-196.

Mullin, M. (2002). Animals and Anthropology. *Society & Animals* 10: 387-393.

Nash, R. (2001). *Wilderness and the American Mind*. Yale University Press. New Haven, CT. 425 pp.

Naughton-Treves, L. (1999). Whose animals? A history of property rights to wildlife in Toro, Western Uganda. *Land Degradation and Development* 10:309-326.

Naughton-Treves, L. (2002). "Wild animals in the garden: Conserving wildlife in Amazonian agroecosystems." *Annals of the Association of American Geographers* 92:488-506.

Naughton-Treves, L., Grossberg, R. and Treves, A. (2003). Paying for tolerance: rural citizens'attitudes toward wolf depredation and compensation. *Conservation Biology* 17: 1500-1511.

Nepal, S. K. and Webe, K. E. (1995). Prospects for Coexistence: Wildlife and Local People. *Ambio* 4: 238-245.

Nyhus, P, Fischer, H., Madden, F. and Osofsky, S. (2003). Taking the Bite out of Wildlife Damage The Challenges of Wildlife Compensation Schemes. *Conservation in Practice* 4: 37–43.

Nyhus, P, Osofsky, S., Ferraro, P., Madden, F., & Fischer, H. (2005). Bearing the costs of human-wildlife conflict: The challenges of compensation schemes. In Woodroffe, R., Thirgood S. and Rabinowitz, A. (Eds). People and Wildlife: Conflict or coexistence. Cambridge? (p. 107-121). University Press, Cambridge, UK.

Oelschlaeger, M. (1991). *The idea of wilderness: From prehistory to the age of ecology*. Vail-Ballou Press. Bringhamton, New York.

Ogra, M. V. (2008). Human–wildlife conflict and gender in protected area borderlands: A case study of costs, perceptions, and vulnerabilities from Uttarakhand (Uttaranchal), India. *Geoforum* 39: 1408–1422.

Osborn, F. V. and Hill, C. M., (2005). Techniques to reduce crop loss: human and technical dimension in Africa. In Woodroffe, R., Thirgood, S. and Rabinowitz, A.

People and Wildlife. Conflict or coexistence. Cambridge University Press, Cambridge, UK

Panchetti F., (2003). *Studio per la realizzazione di un questionario come strumento per una ricerca di human dimension of wildlife management sui conflitti generati dal cinghiale (sus scrofa) in contesti rurali*. Master thesis. Facoltà di Scienze Matematiche Fisiche e Naturali Dipartimento di Biologia Animale e dell'Uomo, Univesità degli Studi di Roma La Sapienza.

Pattison, W.D. (1964). The four traditions of geography. *Journal of Geography*: 211-216.

Peterson, M. N., Birckhead, J. L., Leong, K., Peterson, & M. J., and Peterson, T. R. (2010). Rearticulating the myth of human-wildlife conflict. *Conservation Letters* 3: 74-82.

Phillips, A. A (2007). *Short history of the international system of protected area management categories*. WCPA Task Force on Protected Area Categories.

Philo, C. and Wilbert, C. (2000). *Animal spaces, beastly places: New geographies of human-animal relations*. London: Routledge.

Pomeranz, J.R. (2003). Perception: Overview. In Nadel, L. (Ed.), *Encyclopedia of Cognitive Science*, Vol.3, London: Nature Publishing Group, pp. 527-537.

Pontuale S. (2009). *Human Dimension nella gestione del cinghiale nella Riserva Naturale Regionale del lago di Vico*. Master thesis. Facoltà di Scienze Matematiche Fisiche e Naturali Dipartimento di Biologia Animale e dell'Uomo, Univesità degli Studi di Roma La Sapienza.

Possimgham, H. P., K. A., Wilson, S., J. Andelman and Vynne, C. H. (2006). Protected areas: goals, limitations and design. In Groom, M. J., Meffe, G. K., Carroll, C. R.,

and contributors. *Principles of Conservation Biology.* Third Edition. Sunderland, Massachusetts, U.S.A.

Puček, Z., Belousova, I.P., Krasińska, M., Krasiński, Z.A. and Olech, W. (2004). *European Bison. Status Survey and Conservation Action Plan. IUCN/SSC Bison Specialist Group*. IUCN, Gland, Switzerland and Cambridge, UK.

Raik D., B., Siemer W., F. and Decker, D. J. (2005). Intervention and Capacity Considerations in Community-Based Deer Management: The Stakeholder's Perspective. *Human dimension of Wildlife* 10: 259-272.

Riley, S. J., Decker, D. J., Carpenter, L. H., Organ, J. F., Siemer, W. F., Mattfeld, G. F. and Parsons, G. (2002). The Essence of Wildlife Management. *Wildlife Society Bullettin* 30 (2): 585-593.

Rittel, H.W.J. and Webber, M.M. (1973). Dilemmas in a General Theory of Planning. *Policy Sciences* 4: 155-169.

Reynolds, J. C. and Tappen, S.C. (1996). Control of mammalian predators in game management and conservation. *Mammal Review* 26: 103-127.

Renn, O. (1992). Concepts of Risk: A Classification. Pages 53 – 82. In S. Krimsky and D. Golding. *Social Theories of Risk*. Praeger, Westport, CT.

Rolston, H. (1989). Values in Nature, 74-90. *Philosophy gone wild.* Prometheus Books, New York, U.S.A.

Rothman, H. (2000). *Saving the planet: the American response to the environment in the twentieth century*. Ivan R. Dee, Chicago.

Rulli M. and Savini S., (2008). *Studio di Human Dimension sulla presenza del cinghiale nel Parco Regionale di Veio. Istituto di Ecologia Applicata*. Technical Report 2007. Regional Park Agency Lazio.

Schley L. and Roper, T. J. (2003). Diet of wild boar Sus scrofa in Western Europe, with particular reference to consumption of agricultural crops. *Mammal Review* 33 (1): 43–56.

Scillitani, L., Monaco, A. and Toso, S. (2010). Do intensive drive hunts affect wild boar (Sus scrofa) spatial behaviour in Italy? Some evidences and management implications. *European Journal of Wildlife Research* 56: 307–318.

Sheskin, I. M., (1985). *Survey research for geographers*. Association of American Geographers, Washington, D.C., USA.

Siemer W.F., Connelly N.A. and Decker D.J. (2001). Methods of Inquiry: Some Basics for the Manager. Pages 375-400 *In Human Dimensions of Wildlife Management in North America*. Edited by Decker D.J., Brown T.L. and Siemer W.F. The Wildlife Society, Bethesda, Maryland, USA.

Skonhofta, A. and Solstada, J. T. (1996). Wildlife management, illegal hunting and conflicts. A bioeconomic analysis. *Environment and Development Economics* 1: 165-181.

Soule, M. E. (1985). What is Conservation Biology? A new synthetic discipline addresses the dynamics and problems of perturbed species, communities and ecosystems. *Biosceince* 35: 727-734.

Spangesi M., and De Marinis, A.M. (2002). *Mammiferi d'Italia*. Quaderni della Conservazione della Natura, 14. Ministero dell'Ambiente-Istituto Nazionale della Fauna Selvatica.

Svensson, E. (2000). Comparision of the quality of assessment using continuous and discrete ordinal rating scales. *Biometrical Journal* 42, 417-434.

Swaisgood, R. R., Wei, F., Wildt D. E., Kouba, A. J. and Zhang, Z. (2009). Giant panda conservation science: how far we have come. *Biology Letter* 6:143-5.

Tabachnick, B.G., & Fidell, L.S. (2001). Using multivariate statistics. Allyn and Bacon, Toronto, Ontario, Canada.

TNC (The Nature Conservancy) 2000. The Five-S Framework for Site Conservation: A Practitioner's Handbook for Site Conservation Planning and Measuring Conservation Success. Arlington, Virginia. Retrieved: www.conserveonline.org.

Toso S. and Pedrotti L., (2001). *Linee guida per la gestione del cinghiale (Sus scrofa) nelle aree protette.* Quaderni della Conservazione della Natura, 2, Min. Ambiente - Ist. Naz. Fauna Selvatica.

Treves, A., Wallace, R.B., Naughton-Treves, L., and Morales, A. (2006). Co-managing human-wildlife conflicts: a review. *Human Dimension of Wildlife* 11: 383-396.

Treves, A., and Naughton-Treves, L. (2005). Evaluating lethal control in the management of human-wildlife conflict. In Woodroffe, R., Thirgood S. and Rabinowitz, A. (Eds). *People and Wildlife: Conflict or coexistence*. Cambridge? (p. 86-106). University Press, Cambridge, UK.

Thirgood S., Woodroffe, R. & Rabinowitz, A. (2005). The impact of human- wildlife conflict on human lives and livelihoods, 13-26. In Woodroffe, R., Thirgood S. and Rabinowitz A. *People and Wildlife. Conflict or coexistence*. Cambridge University Press, Cambridge, UK.

Toso S., & L. Pedrotti, 2001 - *Linee guida per la gestione del cinghiale (Sus scrofa) nelle aree protette.* Quad. Cons. Natura, 2, Min. Ambiente - Ist. Naz. Fauna SelvaticaU.S. Bureau of Sport Fisheries and Wildlife. (1955). National survey of fishing and hunting. Washington, DC: U. S. Government Printing Office.

Vaske, J.J., (2008). *Survey research and analysis. Application in parks, recreation and Human Dimensions*. Venture Publishing, Inc., State Collage, Pennsylvania.

Vaske, J. J., Decker, D. J., and Manfredo, M. J. (1995). Human dimensions of wildlife management: An integrated framework for coexistence (pp. 33-49). In R. Knight & K. Gutzwiller (Eds.), *Wildlife and Recreationists: Coexistence Through Management and Research*. Washington, DC: Island Press.

Vaske, J. J., Needham, M. D., Newman ,P., Manfredo, M. J. and Petchenik, J. (2006). Potential for conflict index : Hunters' responses to chronic wasting disease. *Wildlife Society Bulletin*, 34: 44-50.

Venkataraman, A., (2000). Incorporating Traditional Coexistence Propensities into Management of Wildlife Habitats in India. *Current Science* 79: 1531-1535.

Vernesi C., Crestanello B., Pecchioli E., Tar D., Caramelli D., Hauffe H. and Bertorelle G., (2003). The genetic impact of demographic decline and reintroduction in the wild boar (Sus scrofa): a microsatellite analysis. *Molecular Ecology*, 12: 585-595.

Warner, R.M. (2008). *Applied Statistics: from bivariate through multivariate techniques*. SAGE Publications, Inc. U.S.A.

Warren, L. S. (1997). *The hunter's game: poachers and conservationists in twentieth-century America*. Yale University Press, New Haven, CT.

Weladji, R. and Tchamba, M. (2003). Conflict between people and protected areas within the Bénoué Wildlife Conservation Area, North Cameroon. *Oryx* 37: 72–79.

West, P., Igoe, J. and Brockington, D. (2006). Parks and Peoples: The Social Impact of Protected Areas. *Annual Review of Anthropology* 35: 251-277

West, P., and Brockington, D. (2006). An Anthropological perspective on some unexpected consequences of protected areas. *Conservation Biology* 20: 609-616.

Wolch, J. and Emel, J. (1998). *Animal geographies: place, politics and identity in the nature–culture borderlands*. London: Verso.

Woodroffe, R. (2000). Predators and people: using human densities to interpret declines of large carnivores. *Animal Conservation* 3: 165-173.

Woodroffe, R., Thirgood S. and Rabinowitz, A. (2005). *People and Wildlife: Conflict or coexistence?* Cambridge University Press, Cambridge, UK.

WWF (World Wide Fund for nature) (2005) *Human Wildlife Conflict Manual. Wildlife Management Series*. WWF, Southern African Regional Programme Office (SARPO). Harare, Zimbabwe.

WWF (World Wildlife Fund) (2007). *WWF standards of conservation project and program management*. WWF, Gland, Switzerland

Zerunian, S. (2005). *Habitat, flora e fauna del Parco Nazionale del Circeo. Corpo Forestale dello Stato*. Ufficio Gestione Beni ex ASFD di Sabaudia.

7. Paper 1: The conflict-coexistence continuum: a comparison between Likert-type scale and Visual Analogue Scale

Abstract

Interactions between humans and wildlife can influence people's perceptions toward animals. Depending on the type of interaction, perceptions toward wildlife may range from absolute intolerance to the full integration and acceptance of a species within the human landscape. Two case studies were undertaken to examine how to best investigate such perceptions along a continuum that ranges from conflict to coexistence, and to understand the responsiveness, consistency, validity, and reliability of different continuous scale formats. The case studies explore which measuring scale allows researchers to obtain data that most accurately represents public feelings toward wild boar. In the first case study, a five-point Likert-type scale was compared to a classic Visual Analogue Scale (VAS) in Circeo National Park; in the second one, the five-point Likert-type scale was compared to a segmented VAS in the RNR Nazzano-Tevere-Farfa. Differences between scales were highlighted by the Spearman rank correlation coefficient (Circeo rs=0.484, $p<0.01$; Nazzano rs=0.563, $p<0.01$) and the Wilcoxon statistics for paired ordinal variables (Circeo: z=-2.526, $p<0.05$; Nazzano: z=-5.396, $p<0.01$). The results demonstrate that these scales generate different outcomes while measuring negative to positive feelings toward wildlife. The VAS is an innovative tool for investigating human-wildlife interactions; the linear format of this scale enables researchers to explore conflicts and coexistence interactions as continuous and

interrelated concepts – not as separate ideas. Furthermore, the higher discrimination power of the VAS allows more precise evaluation of the degree of human willingness to tolerate a certain wild species or a specific interaction with wildlife.

Keywords: coexistence, conflict, continuous line, questionnaire items, response design effectiveness.

Introduction

Human-wildlife interactions have often been considered in terms of human-wildlife conflicts (Peterson et al. 2010). Most of the work on this topic has focused on people's real or perceived economic, social, or cultural negative experiences with wildlife to help understand how to minimize conflicts (Messmer 2000; Treves et al. 2006; Messmer 2009; Peterson et al. 2010). As a result, negative interactions and the conflict between people and animals have become focal themes in human dimension (HD) research (Messmer 2000; Manfredo and Dayer 2004; Madden 2004a; Distefano 2005; Treves et al. 2006; Messmer 2009; Peterson et al. 2010). However, human-wildlife interactions are not only about conflict experiences; they also encompass intentional and unintentional neutral or positive encounters, as well as relationships of coexistence between human and wildlife. Consequently, perceptions toward animals can range from conflict and dislike (e.g., poison baits, illegal killing of species) to coexistence and enjoyment (e.g., bird-watching, ecotourism), depending on how individuals or different interest groups perceive a specific interaction with a certain species.

Focusing only on negative experiences, rather than also including neutral and positive interactions between humans and wildlife, has often limited the ability of researchers to deal with issues such as crop raiding, livestock depredation, and wildlife killing humans (Peterson et al. 2010). To better understand how people's perceptions affect species management and conservation, there is a need to move beyond looking at conflict interactions in isolation, and to start considering neutral to positive human-wildlife contact. To addresses this need, public perceptions toward wildlife are explored along a continuum that encompasses the full range of perceptions, from conflict to slight annoyance to the integration and coexistence of species within the human landscape. Since the conflict-coexistence continuum has never before been considered while addressing human-wildlife interactions, a methodological approach is proposed in this paper. To explore the overarching goal – to understand how different rating scales measure people's negative, neutral, and positive perceptions toward wildlife – itemized and continuous rating scales are compared. Specifically, this study explores the feelings of participants toward wild boar in two protected areas in Italy (Circeo and Nazzano-Tevere-Farfa). The objective of this paper is to investigate if continuous rating scales, such as the classic and the segmented Visual Analogue Scale (VAS), can measure conflict and coexistence along a continuous line in a more detailed way than a scale with fixed and categorical answers, such as the five-point Likert-type scale.

To our knowledge, no previous research has explored which scale design enables a more detailed measurement of people's negative, neutral, and positive perceptions of wildlife. This comparison between scales of conflict and coexistence is not only

innovative for HD, it further assesses how different rating scales can be used in social science disciplines. By developing a better knowledge about the characteristics of different scale formats and by comparing two types of continuous rating scales with a Likert-type scale, questions can be designed that better explore any dichotomy concept, such as conflict and coexistence. Understanding which scale provides more comprehensive information about human-wildlife conflict and coexistence perceptions will help researchers recognize when a major disagreement turns into a small nuisance, or when a small nuisance evolves into a slightly tolerated annoyance. It will also enable identify when coexistence, and the integration and acceptance of wildlife within the human-shaped landscape, finally occurs.

Rating scale formats: Likert-type scales and continuous rating scales

Researchers have traditionally studied rating scale formats and their ability to measure attitudes in an objective way (Hall and Hall 1996; Dillman 2000; Svensson 2000; Lange and Söderlund 2004; Jamieson 2004; Vaske 2008; Christ and Boiceb 2009). Different types of scales, such as Likert-type scales, Guttman scales, paired comparison scales, Thurstone attitudinal scales, continuous rating scales, and behaviourally anchored rating scales have been developed and explored over time in attitudinal studies (Mosteller et al. 1954; Albarracin et al. Christ and Boice 2009). Traditionally, human dimension researchers have used the Likert-type scale because this item format is simple to understand by respondents, is versatile in analyzing data, and generates replicable results over time (Svensson 2000). Characterized by categories that range from negative to positive statements (e.g. strongly disagree to strongly agree), the Likert-type scale is an

itemized rating scale used to measure the direction and intensity of an attitude about a specific topic (Mosteller et al. 1954; Matell and Jacoby 1971; Masters 1974; Cox 1980; Oaster 1989; Chang 1994; Jamieson 2004; Weng 2004; Preston and Colman 2000). Likert-type scales with five to nine response points have been recognized as the most suitable instrument for public opinion assessments (Cox 1980; Friedman and Friedman 1986; Preston and Colman 2000; Lange and Söderlund 2004). The wide use of this type of scale has resulted in the rise of methodological debates. Controversies have concerned how the neutral option (i.e., neither like nor dislike) affects data collected through Likert-type scales (Guy and Novell 1977; Armstrong 1987; Wandzilak et al. 1987; Ryan and Garland 1999; Raaijmakers et al. 2000; Lange and Söderlund 2004). In addition, the impact of extreme responses on data can be a controversial topic; the direction and intensity of attitudes may be underreported or overreported when the scale used has a limited number of response categories (Albaum and Murphy 1988; Lau 2008). Further issues have arisen about how the labels underneath the scales influence the respondent's ability to answer a question (Dobson and Mothersill 1979; Wyatt and Meyers 1987; Chang 2000; Weng 2004). Thus, debates over the impact of Likert-type scale design on the public's ability to respond to a question (Albanese et al. 1997; Jamieson 2004), and on the reliability and validity of the data obtained through this scale have become common (Matell and Jacoby 1971; Masters 1974; Chang 1994; Preston and Colman 2000; Weng 2004).

To remove the neutral alternative, limited response categories, and labels underneath the scale from the item format design, and to obtain responses with finer

discrimination power (Christ and Boice 2009), continuous rating formats have been developed (Freyd 1923; Aitken 1969; Cline et al. 1992; Ahearn 1997; Svensson 2000; Couper et al. 2004). One of the best-known continuous rating scales is the Visual Analogue Scales (VAS). This scale is a horizontal or vertical line, anchored at either end by opposite response categories (Ahearn 1997; Svensson 2000; Couper et al. 2004; Lange and Söderlund 2004). The direction and intensity of a participant's attitude is recorded by putting a cross anywhere along the bipolar response continuum of the VAS (Svensson 2000; Couper et al. 2004; Christ and Boice 2009). This continuous scale can be further divided into segments, with or without verbal descriptors underneath it (Freyd 1923; Ahearn 1997; Svensson 2000; Couper et al. 2004). This scale has been mostly applied for its ability to collect data with a finer discrimination power than other rating formats, and for avoiding issues related to predetermined response categories (Friedman and Friedman 1986; Guyatt et al. 1987; Cline et al. 1992; Ahearn 1997; Christ and Boice 2009). While VAS may be considered more precise in its measurements than Likert-type scale formats, it has also disadvantages. It can be difficult to understand by some participants, time consuming to answer, and difficult to score for researchers (Guyatt et al. 1987; Ahearn 1997; Svensson 2000; Lange and Söderlund 2004; Christ and Boice 2009).

A comparison between five-point Likert-type scale and VAS

To determine if different item formats influence data outcomes, itemized rating scales have been often compared with continuous rating scales. Five or seven-point Likert-type scales have been linked with the VAS to explore if different item formats generate similar outcomes (Lange and Söderlund 2004). This comparison also helps to

understand which response design is preferred by participants (Laerhoven vanet al. 2004), and investigates the responsiveness (Guyatt et al. 1987), consistency (Svensson 2000), validity (Friedman and Friedman 1986) and reliability (Cook et al.2001) of different design formats. If a single concept is measured with interchangeable questions or variables, similar results should be produced (Vaske 2008). However, by exploring the same item with different scale formats, conflicting results have been obtained: while respondents answered differently depending on the scale applied in some case studies (Brunier and Graydon 1996; Svensson 2000), in other cases no significant differences were found between Likert-type scales and VAS (Guyatt et al. 1987; Cook et al. 2001; Laerhoven et al. 2004; Lange and Söderlund 2004).

Due to this lack of agreement (Guyatt et al. 1987; Brunier and Graydon 1996; Svensson 2000; Cook et al. 2001; Laerhoven et al. 2004; Lange and Söderlund 2004), a comparison between a five-point Likert-type scale and VAS was carried out to understand if continuous rating scales can measure the conflict-coexistence continuum in a more refined way. Specifically, two case studies on wild boar (*Sus scrofa*) were carried out in Italy to compare: 1) a five-point Likert-type scale with a classic VAS in Circeo National Park and 2) a five-point Likert-type scale with a segmented VAS in the Regional Nature Reserve (RNR) Nazzano-Tevere-Farfa. In the second case study, the continuous scale was segmented to understand how the presence of predetermined categories could influence a participant's abilities to plot an answer along a continuous scale. In both cases, no significant differences between the two scales were expected while measuring conflict to coexistence perceptions toward wild boar. The null

hypotheses were that no significant differences in 1) responsiveness, 2) validity, and 3) reliability would be generated by different scales while collecting data on the same variable. To test this assumption, basic characteristics of response design, such as ease of answering the item and preferred rating scale technique, were explored. It is important to bear in mind that the main goal of this paper is to compare the Likert-type scale with the classic and segmented VAS to understand how different scale formats measure perceptions of conflict and coexistence. No statistical analysis was carried out between VAS scales; only between the five-point Likert-type scale and the corresponding VAS line per case study. Comparisons between the two continuous scales were also avoided due to the fact that data were collected from two different protected areas and sample populations, making statistical analysis between such design questions challenging.

Data analysis

The effects of alternative rating scale formats were explored by asking participants to express their opinion about wild boar twice. The interviewer first asked participants for their opinions regarding wild boar based on a five-point Likert-type scale. Respondents were then asked to mark a "cross" along a continuum between the extremes of "strongly dislike" and "strongly like" on a VAS line. If participants were not willing to mark a cross along the line, they were requested to respond to the VAS question by expressing their feelings toward the species as a percentage (from 0% to 100%). The response on the VAS was measured as the distance from the left end-point to the participant's cross. Measurements were made with a ruler and had an accuracy of 0.05 mm.

Exploratory statistics were carried out using the software SPSS version 17 (SPSS 2008). Since the units of the two scales were different, the coefficient of variation was the best measurement to use for comparing the variability of the two response formats. This coefficient measures the dispersion of data points in a data series around the mean, eliminating effects due to scale and units (Fowler et al. 1998). The two scales were used in their original score formats for this analysis only.

To further explore differences between rating scales, means, standard deviations, the Wilcoxon statistic for paired ordinal variables and the Spearman rank order correlation coefficients were also carried out. To be able to compare the five-point Likert-type scale range with the scores derived from the VAS, both scales were converted and normalized to a value that fell in the range of 0 to 1, where 0 represent perceptions of total conflict and 1 of total coexistence with wild boar. Normalizing the data was necessary for true comparisons of mean levels between the two response formats.

The Wilcoxon statistic for paired ordinal variables was applied to determine whether participants expressed their opinions about wild boar in the same way across rating scale formats. This test was selected to evaluate if the same outcomes are generated using the five-point Likert-type scale and a VAS line (Fowler et al. 1998; Warner 2008). If it is assumed that the two rating scales generate the same response, then no significant differences between the Likert-type scale and the VAS are expected. In contrast, significant differences between rating scales would mean that the two scale formats do measure an item differently. A significance level of $p < 0.05$ was used (Fowler et al. 1998; Vaske 2008).

The correlation between the two response options was explored by computing a Spearman rank order correlation coefficient between the two rating scales (Warner 2008; Vaske 2008). If it is assumed that one of the two response formats best represents participant opinion about wild boar, then high correlation coefficients between the two formats is expected for high reliability of both responses. In contrast, low correlation coefficients between rating scales would mean that one format is less reliable than the other. For this analysis, correlation coefficients were considered high when $rs \geq 0.7$, modest when between $0.69 \leq rs \leq 0.4$, and low when $rs \leq 0.39$ (Fowler et al. 1998).

To take into account the possible effects of a large sample size, Eta measures are reported (Vaske 2008). This effect size index allows for easier interpretation of results by evaluating the strength of association between variables in studies with large sample sizes. Indeed, too much power provided by large samples may generate significant findings with little practical utility (Vaske 2008) when not supported by effect size indices (Kotrlik and Wiliams 2003).

CASE STUDY 1

The first study was designed to compare a five-point Likert-type scale and a classic VAS. This case study on wild boar was carried out in Circeo National Park, Italy.

Experimental design

The VAS applied in the first case study was a 120 mm continuous line anchored at either end by the extreme answers (i.e., strongly dislike and strongly like) of the

corresponding five-point Likert-type scale (Figure 7.1). The length of the line was selected based on the ruler used to make the measurements of the VAS line. Except for the descriptors at either extreme, no categorical descriptions were placed beneath this continuous line.

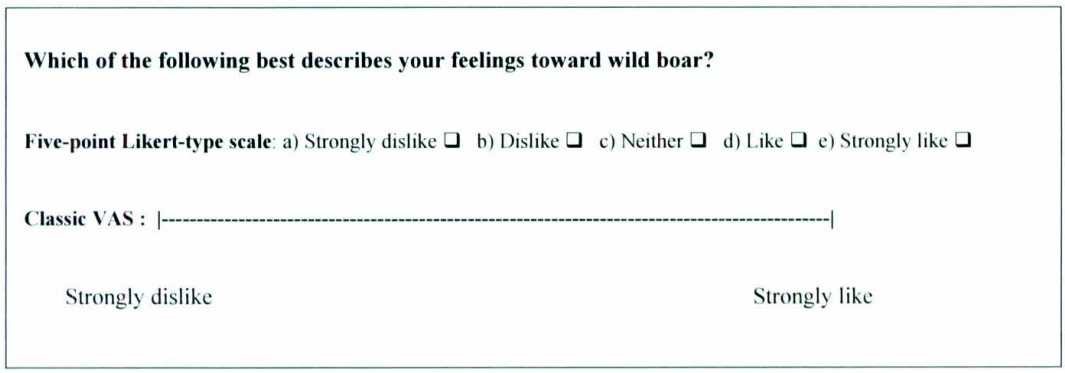

Figure 7.1. Illustrative layouts of the five-point Likert-type scale and the classic Visual Analogue Scale (VAS) format applied in Circeo National Park.

Data collection

A face-to-face questionnaire of 66 items was administered to the general public in Circeo National Park in the spring and summer of 2008. The appropriate strata and sample size for the communities present within Circeo National Park were calculated from the most recent national census (ISTAT 2001). A total of 801 face-to-face interviews were carried out, proportional to the sample population of Circeo National Park (ISTAT 2004). This sample generates results with a confidence level of 95% and a confidence interval of 5%, an acceptable standard in social science research (Sheskin 1985; Vaske 2008). After having checked the data for outliers, 792 completed questionnaires were deemed appropriate for data analysis.

Results

Data analysis focused on the single item "feelings toward wild boar." Among the 792 participants, 73% (n= 582) marked a cross along the classic VAS line. Of the total sample, 31% was between 18 and 39 years old, 46% between 40 and 64 years of age and 23% over 65 years old. There were slightly more females (53%) than males (47%) in the total sample of Circeo National Park.

To better understand participants' responsiveness across rating scale formats, the mean and the standard deviation were calculated for the normalized values of the two rating techniques on the single item "feelings toward wild boar" (Figure 7.2). Both resulted higher for the classic VAS ($\bar{x}$ = 0.35, SD = 0.252) in comparison to the five-point Likert-type scale ($\bar{x}$ = 0.328, SD = 0.184) (Fig. 8.2). By further investigating with the coefficient of variation participant responsiveness, a higher percentage of dispersion of data was recorded for the classic VAS (VAS=73%; Likert=56%) (Fig. 7.2). The larger data dispersion for the classic VAS may be attributed to the finer refinement of this scale format.

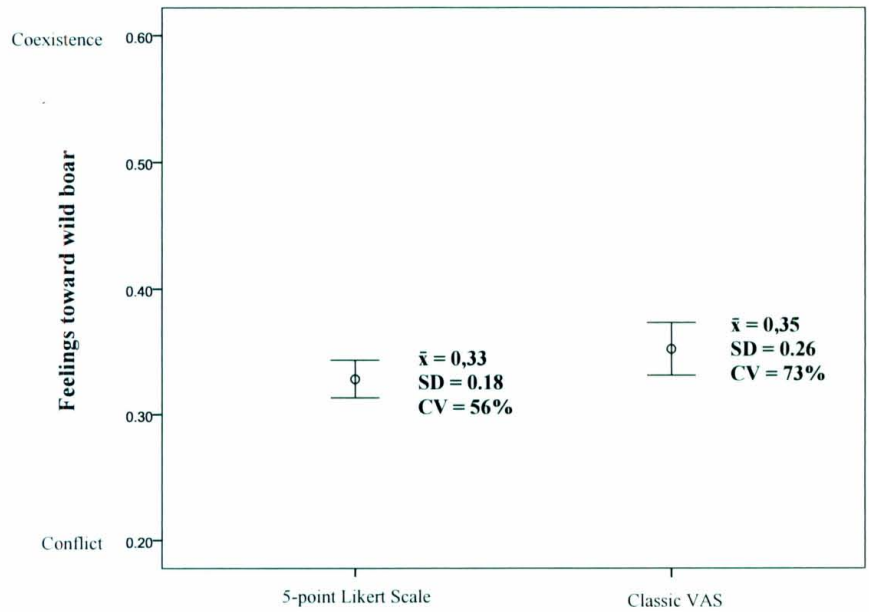

Figure 7.2. Error bar, mean ($\bar{x}$), standard deviation (SD) and coefficient of variation (CV) for the five-point Likert-type scale and the classic Visual Analogue Scale (VAS) used in Circeo National Park. The band near the middle of the box represents the median of the data.

The Wilcoxon statistic for paired ordinal variables was applied to evaluate if the same responses were generated through the administration of alternative scale formats. The results obtained through this statistical analysis highlighted significant differences between the five-point Likert-type scale and the classic VAS line (z = -2,798, p<0.05, Eta= 0.491). Such differences were not due to a large sample size effect. The hypothesis that the two scales produce similar outcomes is rejected. Thus, the refinement of the scale, the ease of use, and the understandability of the tools may have played a fundamental role in generating differences across scale formats.

A Spearman rank correlation coefficient was performed to explore the relative reliability of the two rating scale options. Overall, the classic VAS moderately correlated with the five-point Likert-type scale in Circeo (r_s=0.487, p<0.01, Eta=0.706). Again, the significance of correlation was not due to large sample size effect. The moderate significance obtained through the Spearman correlation coefficient between the classic VAS and the five-point Likert-type scale did not enable the researcher to consider these two scales reliable. The hypothesis that the two scales generate outcomes with similar responsiveness, validity, and reliability despite their different design is rejected.

CASE STUDY 2

The second study was designed to compare a five-point Likert-type scale and a segmented VAS. This case study on wild boar was carried out in the RNR Nazzano-Tevere-Farfa, Italy.

Experimental design

The VAS applied in the second case study (Figure 8.3) was a 130 mm continuous line divided by a break every 32.5 mm (for a total of three breaks) between the two extremes. To allow the addition of the three breaks and to use the same ruler to measure the outcomes of the VAS, this scale was designed longer than the one in the first case study. The ends of the segmented VAS were anchored by the opposite descriptors (i.e., strongly dislike and strongly like) of the corresponding five-point Likert-type scale (Fig. 7.3). Except for the descriptors at either extreme, no categorical descriptions were placed beneath this continuous line.

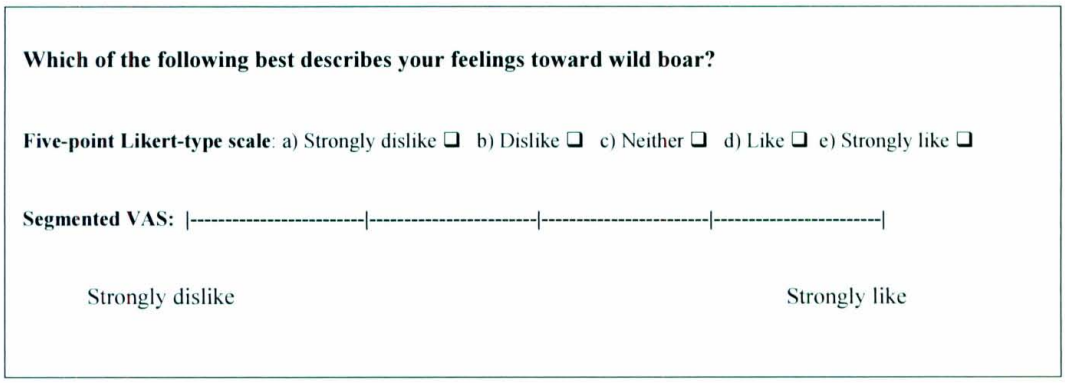

Figure 7.3. Illustrative layouts of the five-point Likert-type scale and the segmented Visual Analogue Scale (VAS) format applied in the Regional Nature Reserve of Nazzano-Tevere-Farfa.

Data collection

A face-to-face questionnaire composed of 66 items was administered to the general public in the RNR Nazzano-Tevere-Farfa in the spring and summer of 2009. The appropriate strata and sample size for the communities present within the reserve were calculated from the most recent national census (ISTAT 2001). A total of 400 face-to-face interviews were carried out in RNR Nazzano-Tevere-Farfa in this timeframe and all of them were used for data analysis.

Results

Data analysis focused on the single item "feelings toward wild boar." Of the total sample, 30% was between 18 and 39 years old, 52% between 40 and 64 years of age, and 18% over 65 years of age. There were slightly more males (55%) than females (45%) in the total sample of RNR Nazzano-Tevere-Farfa. For the segmented VAS, 67% (n=269) of participants marked a cross along the line.

In RNR Nazzano-Tevere-Farfa, the mean and the standard deviation were higher for the segmented VAS format ($\bar{x}$= 0.54, SD= 0.29) than for the five-point Likert-type scale ($\bar{x}$= 0.455, SD= 0.27) (Figure 7.4). Also for the coefficient of variation, a higher percentage of dispersion of data was recorded for the segmented VAS (Likert= 34%, VAS= 62%).

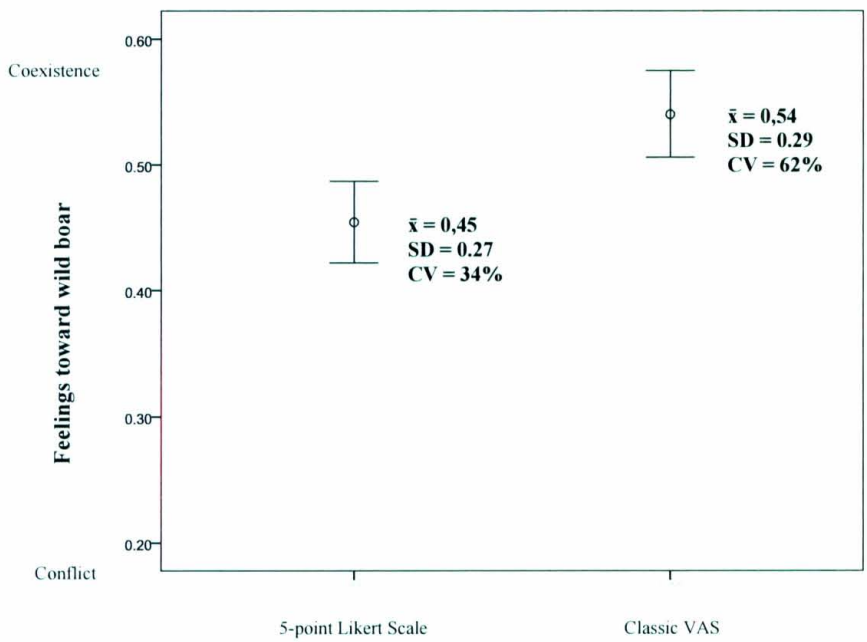

Figure 7.4 Boxplot, mean, standard deviation (SD), and coefficient of variation (CV) for the five-point Likert-type scale and the segmented Visual Analogue Scale (VAS) used in the Regional Nature Reserve (RNR) of Nazzano-Tevere-Farfa. The band near the middle of the box represents the median of the data.

Significant differences between the five-point Likert-type scale and the segmented VAS line (z = -5.396, p <0.01, Eta= 0.597) were highlighted through the Wilcoxon statistics for paired ordinal variables. Such differences were not due to large sample size effect. The Spearman rank correlation coefficient showed a moderate correlation between

the segmented VAS and the five-point Likert-type scale in Nazzano (r_s=0.563, p<0.01, Eta= 0.767). The significance of correlation was, also in this case, not due to large sample size effect. As for the first case study, the results of the Wilcoxon statistics and the Sperman rank correlation allow for the rejection of the hypothesis that no differences in 1) responsiveness, 2) validity, and 3) reliability between scales were generated when using different scale formats to collect data on the same variable.

General Discussion

Data on the single item "feelings toward wild boar" were collected through a five-point Likert-type scale and two VAS lines to understand how response design influences participant answers about an attitudinal item. However, not all participants agreed to make an X along the VAS line. Their unwillingness to replay an item along a continuous line format can be attributed to several factors. The fear of being swindled and the lack of exposure Italians have to surveys using continuous rating scales made respondents reluctant to answer the VAS question. In addition, earlier parts of the questionnaire involved the interviewer transcribing participant's responses, not respondents answering items with a mark. Participants did not understand or want to switch answer style and make an "X" along the VAS line. Another reason behind people's unwillingness to use the VAS was their uncertainty about what was expected of them while using the continuous rating scale. Similar results were found by other researchers (Ahearen 1997; Lange and Söderlund 2004); respondents had trouble grasping the line response format and had difficulty finely describing their opinion about a specific topic.

As highlighted through the coefficient of variation, the scales applied in both case studies generated outcomes with different responsiveness and reliability. The greater refinement of the VAS format allowed for the detection of very small changes across responses (Guyatt et al. 1987; Ahearn 1997; Svensson 2000; Christ and Boice 2009). Thus, continuous rating scales create answers with more variance than itemized rating scales (Cook et al. 2001). However, by adding breaks to the VAS line in the second study area, the discriminatory power of the continuous rating scale was reduced. The presence of response categories on both scales made the five-point Likert-type scale and the segmented VAS more similar in scale refinement (Ahearn 1997). Consequently, more consistent outcomes were obtained while comparing the two scales in Nazzano-Tevere-Farfa than in Circeo. Further systematic differences were documented regarding correlations between the itemized and the continuous scale in both case studies. The Wilcoxon statistics for paired ordinal variables and the Spearman rank correlation coefficient highlighted that the five-point-Likert-type scale and the VAS scale generated dissimilar outcomes in both areas. These results were independent of the VAS line format used or the protected area in which it was tested.

Conclusion

The Likert-type scale has been recognized by scientists as an essential tool for collecting data about human opinions and possible action in regard to specific topics (Dillman 2000; Browne-Nuñez and Jonkerb 2008; Vaske 2008). Despite their usefulness, rating scale formats with predetermined categories and quantitative terms may not always be the best tools to collect attitudinal data. For example, categorical definitions or words

used in these scales may not always be interpreted or finely discriminated by participants as expected by the researcher. Thus, such diverse understanding may generate different outcomes than anticipated by the questionnaire designer (Conrad and Schober 2005). To overcome those limits, we need to build upon the knowledge and experience gained over time by researchers on itemized rating scales and expand it to other scale formats, such as the continuous rating scales.

Continuous rating scales should not be applied as substitutes for Likert-type scales, but as distinct instruments to measure people's attitude, perceptions, and behaviours toward an issue in a finer way. As found in other studies (Lange and Söderlund 2004; Christ and Boice 2009), more details about the intensity of a perception can be detected with the VAS scale, as participants are not restricted by answering an item with predetermined categories and scale labeling. Continuous rating scales provide a finer evaluation of participants' feelings toward a specific topic than Likert-type scales (Lange and Söderlund 2004; Christ and Boice 2009). Thus, the VAS can be applied as a working tool to investigate negative, neutral, and positive perceptions of human-wildlife interactions, as its linear format enables a finer description of the public's willingness to tolerate a certain species, or a specific interaction with wildlife.

The VAS represents an innovative tool for investigating human-wildlife interactions. The linear format of this scale enables researchers to explore negative to positive perceptions as continuous and interrelated concepts. This scale format allows the designation of such perceptions along a continuum ranging from conflict to coexistence (Figure 7.5).

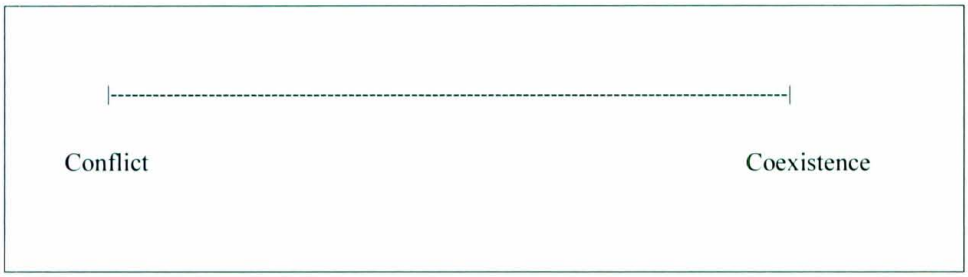

Figure 7.5. Illustrative layouts of how the classic Visual Analogue Scale (VAS) format could be applied to explore conflict and coexistence along a continuous line.

By applying the continuous scale to this newly designed conflict-coexistence continuum, it will be possible to explore the degree of people's willingness to tolerate a certain wild species or a specific interaction with wildlife. This will allow a more accurate evaluation of the point at which human-wildlife conflicts start to turn into tolerance interactions. The conflict-coexistence continuum can remain the same across countries, languages, and cultures and can thus be applied in broader contexts. This type of scale may enable researchers to overcome some cultural challenges, such as different understandings of question wording and illiteracy. By further investigating response wording and design, researchers will be able to develop items that best evaluate human thought and action toward specific research topics, and thus design public involvement and conflict resolution techniques that enhance tolerance rather than conflict.

Future research

From the classic VAS scale perspective, it is important to better understand response designs and performances, since these are important characteristics used to build

suitable data collection instruments in social science. A framework for standards of best practice in continuous rating scale design and application is needed to understand how to apply this scale format to explore and further develop the conflict-coexistence continuum. The framework should take into account standards for continuous item development, best sampling techniques, suggested statistical analysis, reliability, validity, and generalization of the outcomes (Ahearn 1997; Svensson 2000). Identifying principles to monitor, evaluate, and replicate the study should also be part of this ideal framework. By developing familiarity with such scales, researchers will be able to use this item design and demonstrate its rigor in their research. Guidelines on how to best apply the VAS scale could be also used to replicate the study described in this paper. A deeper knowledge of VAS features would enable researchers to maximize the potential and proficiency of this scale, and gather data that best characterizes the conflict-coexistence continuum. Specifically, future guidance on the application of continuous rating scales will enable researchers to design questions that truly investigate the full range, from conflict to coexistence, of human-wildlife interactions.

Addressing conflict situations in isolation does not necessarily lead towards maximizing coexistence; positive and neutral attitudes toward wildlife also affect wildlife management and conservation projects. To better encompass the whole range of human-wildlife interactions in wildlife management and conservation, there is a need to further develop the conflict-coexistence continuum concept. In order to implement the idea of conflict and coexistence as interrelated concepts on the same continuous line, human-wildlife interactions need to be redefined and acknowledged by social scientists as any

negative, neutral, and/or positive perceptions toward animals that influence people's willingness to coexist with wildlife. Since similar human-wildlife interactions may be perceived differently depending upon conservation law enforcement, economic benefits, and other aspects of societies living with wildlife, factors including values, culture, and geographical location should be considered while implementing the conflict-coexistence concept. The classic VAS could be applied to explore the influence of different variables, such as people's values and knowledge about the species, on the conflict-coexistence continuum.

Researchers and managers may use the VAS as a working tool to explore the intensity of negative, neutral, and positive perceptions toward wildlife, and to understand the influence of different variable. By doing so, they will be able to further develop the concept of conflict and coexistence as a continuous line. By better addressing conflict, and by more consistently including positive interactions between people and wildlife in management and conservation, people's tolerance and willingness to coexist with wildlife in the same landscape will be enhanced.

References

Albanese, Mark, Carolyn Prucha, Jodi H. Barnet, and Craig L. Gjerde. 1997. "The Effect of Right or Left Placement of the Positive Response on Likert-Type Scales Used by Medical Students for Rating Instruction." *Academic Medicine* 72:627-630.

Albaracin, Dolores, Blair T. Johnson, and Mark P. Zanna. 2005. *The handbook of attitudes*. Lawrence Erlbaum Associates, Inc., Publishers, Mahwah, New Jersey.

Album, Gerald, and Brian D. Mutphy. 1988. "Extreme Response on a Likert Scale." *Psychological Reports* 63:501-502.

Ahearn, Eileen P. 1997. "The Use of Visual Analogue Scales in Mood Disorders: A Critical Review." *Journal of Psychiatric Research* 31:569-579.

Aitken, R.C.B. 1969. "Measurements of Feelings Using a Visual Analogue Scale." *Proceedings of the Royal Society of Medicine* 62:989-993.

Armstrong, Robert L. 1987. "The Midpoint on a Five-Point Likert-Type Scale." *Perceptual and Motor Skills* 64:359-362.

Browne-Nuñez, Christine, and Sandra A. Jonkerb. 2008. "Attitudes Toward Wildlife and Conservation Across Africa: A Review of Survey Research." *Human Dimensions of Wildlife* 13:47-70.

Brunier, Gillian, and Jane Graydon. 1996. "A Comparison of Two Methods of Measuring Fatigue in Patients on Chronic Haemodialysis: Visual Analogue vs. Likert Scale." *International Journal of Nursing Study* 33:338-348.

Chang, Lei. 1994. "A Psychometric Evaluation of 4-Point and 6-Point Likert-Type Scales in Relation to Reliability and Validity." *Applied Psychological Measurements* 18:205-215.

Chang, Lei. 2000. "Dependability of Anchoring Labels of Likert-Type Scales." *Educational and Psychological Measurement* 5:800-807.

Christ, Theodore J., and Christina Boice. 2009. "Rating Scale Items. A Brief Review of Nomenclature, Components, and Formatting to Inform the Development of Direct Behavior Rating (DBR)." *Assessment for Effective Intervention* 34:242-250.

Cline, Margarete C., Joanne Herman, Elizabeth R. Shaw, and Donald R. Morton. 1992. "Standardization of the Visual Analogue Scale." *Nursing Research* 41:378-379.

Conrad, Frederick G., and Michael F. Schober. 2005. "Promoting Uniform Question Understanding in Today's and Tomorrow's Surveys." *Journal of Official Statistics* 21: 215–231.

Cook, Colleen, Fred Heath, Russel L. Thompson, and Bruce Thompson. 2001. "Score Reliability in Web-or Internet-Based Surveys: Unnumbered Graphic Ratings Scales versus Likert-Type Scales." *Educational and Psychological Measurement* 61:697-706.

Couper, Mick P., Roger Tourangeau, Frederick G. Conrad, and Eleanor Singer. 2006. "Evaluating the Effectiveness of Visual Analog Scales. A Web Experiment." *Social Science Computer Review* 24:227-245.

Cox, Eli P. III. 1980. "The Optimal Number of Response Alternatives for a Scale: A Review." *Journal of Marketing Research* 18:407-422.

Dillman, Don A., James A. Christenson, Edwin H. Carpenter, and Ralph M. Brooks. 1974. "Increasing Mail Questionnaire Response: A Four State Comparison." *American Sociological Review* 39:744-756.

Distefano, Elisa. 2005 *Human-Wildlife Conflict Worldwide: A collection of case studies, analysis of management strategies and good practices*. SARD Initiative Report, FAO, Rome.

Dobson, Keith S., and Kerry J. Mothersill. 1979. "Equidistant Categorical Labels for Construction of Likert-Type Scales." *Perceptual and Motor Skills* 4:575-580.

Friedman, Linda W., and Hershey H.Friedman. 1986. "Comparison of Itemized vs. Graphic Rating Scales: A Validity Approach." *Journal of the Market Research Society* 28:285-289.

Freyd, Max. 1923. "The Graphic Rating Scale." *Journal of educational Psychology* 14:83-102.

Fowler, Jim F., Lou Choen, and Phil Jarvis. 1998. *Practical Statistics for Field Biology*. Second Edition. John Wiley and Sons Ltd. West Sussex, England.

Guy, Rebecca F., and Melissa Norvell. 1977. "The Neutral Point on a Likert Scale." *The Journal of Psychology* 95:199-204.

Guyatt, Gordon H., Marie Townsend, Leslie B. Berman and Jana L. Keller. 1987. "A Comparison of Likert and Visual Analogue Scale for Measuring Change in Function." *Journal of Chronic Diseases* 40:1129-1133.

Hall, David, and Irene Hall. 1996. *Practical Social Research: Project Work in the Community*. Macmillan Press LTD, London.

ISTAT, 2004. *Rapporto annuale 2004.* www.istat.it.

Jamieson, Susan. 2004. "Likert Scale: How to Ab(use) Them." *Medical Education* 38:1217-121.8

Kotrlik, Joe W., and Heater A. Wiliams. 2003. "The Incorporation of Effect Size in Information Technology, Learning and Performance Research." *Information Technology, Learning and Performance Research Journal* 21:1-7.

Lange, Fredrik, and Magnus Söderlund. 2004. *Response Formats in Questionnaires: Itemized Rating Scales Versus Continuous Rating Scales.* SSE/EFI Working Paper Series in Business Administration, No. 2004, 13.

Laerhoven van, Henriette, Hester J. der Zaag-Loonen van, and Bert H. F. Derkx. 2004. "A Comparison of Likert Scale and Visual Analogue Scales as Response Options in Children's Questionnaires." *Acta Paediatr* 93:830-835.

Laerhoven van, Henriette, Hester J. der Zaag-Loonen van, and Bert H. F. Derkx. 2004. "A Comparison of Likert Scale and Visual Analogue Scales as Response Options in Children's Questionnaires." *Acta Paediatr* 93:830-835.

Madden, Francine. 2004. Creating coexistence between humans and wildlife: global perspectives on local efforts to address human-wildlife conflict. *Human Dimensions of Wildlife* 9: 247-257.

Manfredo, Michael, and Ashley Daye. 2004. Concepts for Exploring the Social Aspects of Human-Wildlife Conflict in a Global Context. *Human Dimensions of Wildlife* 9: 1-20.

Matell, Michael S., and Jacob Jacoby. 1971. "Is There an Optimal Number of Alternatives for Likert Scale Items? Study 1: Reliability and Validity." *Educational and Psychological Measurement* 31:657-674.

Masters, James R. 1974. "The Relationship between Number of Response Categories and Reliability of Likert-Type QuestionnairesMessmer, T. A. (2000). The emergence of human-wildlife conflict management: turning challenges into opportunities. International Biodeterioration and Biodegradation. 45, 97-102.

Messmer, Terry A. 2009. Human-wildlife conflicts: emerging challenges and opportunities. *Human-Wildlife Conflicts* 3: 10-17.

Mosteller, Frederick, Robert R. Bush, Bert F. Green, and Gardner Lindzey. 1954. *Selected Quantitative Techniques and Attitudes Measurements.* Addison-Wesley Publishing Company, Inc. Philippines.

Oaster, Thomas. R. F. 1989. "Number of Alternatives per Choice Point and Stability of Likert-Type Scales." *Perceptual and Motor Skill* 68: 594-550.

Peterson, Niels M., Jessie L. Birckhead, Kristen Leong, Markus J. Peterson, and Tarla Rai Peterson. 2010. Rearticulating the myth of human-wildlife conflict. *Conservation Letters* 3: 74-82.

Preston, Carolyn C., and Andrew M. Colman. 2000. "Optimal Number of Response Categories in Rating Scale: Reliability, Validity, Discriminating Power, and Respondent Preferences." *Acta Psychologica* 104:1-15.

Raaijmakers, Quinten, Anne A. van Hoof, Harm 't Hart, Tom F. M. A. Verbogt, and Wilma A. M. Vollebergh. 2000. "Adolescents' Midpoint Responses on Likert-Type Scale Items: Neutral or Missing Values?" *International Journal of Public Opinion Research* 12:208-216.

Ryan, Chris, and Ron Garland. 1999. "The Use of a Specific Non-Response Option on Likert-Type Scales." *Tourism Management* 20:107-113.

Sheskin, Ira M. 1985. *Survey Research for Geographers. Association of American Geographers,* Washington, D.C., USA.

Svensson, Elisabeth. 2000. "Comparison of the Quality of Assessment Using Continuous and Discrete Ordinal Rating Scales." *Biometrical Journal* 42:417-434.

Treves, Adrian, Robert B. Wallace, Lisa Naughton-Treves, and Andrea Morales. 2006. Co-managing human-wildlife conflicts: a review. *Human Dimension of Wildlife* 11: 383-396.

Vaske, Jerry J. 2008. *Survey research and Analysis. Application in Parks, Recreation and Human Dimensions.* Venture Publishing, Inc., State Collage, Pennsylvania.

Wandzilak, Thomas, Charles J. Ansorge, and Glenn Potter. 1987. "Utilizing "Undecided" Option with Likert Items: Associated Measurement Problems." *International Journal of Sports Psychology* 18:51-58.

Warner, Rebecca M. 2008. *Applied Statistics: from bivariate through multivariate technique.* Sage Publications, Inc. Thousand Oak, California.

Wyatt, Randall L., and Lawrence S. Meyers. 1987. "Psychometric Properties of Four 5-Point Likert-Type Response Scales." *Educational and Psychological Measurement* 47:27-35.

Weng, Li-Jen. 2004. "Impact of the Number of Response Categories and Anchor Labels on Coefficient Alpha and Test-Retest Reliability." *Educational and Psychological Measurement* 64:956-972.

8 Paper 2: Conflict and coexistence in protected areas borderlands: a wild boar case

Abstract

Human-wildlife interactions are becoming more evident worldwide, especially along the boundaries of protected areas. Applying different strategies to manage wildlife impacts inside or outside protected areas can lead to human-human and human-wildlife conflicts. Thus, protected areas and their borderlands are ideal locations in which to investigate the public's negative to positive perceptions toward species and to examine how the perceptions arise and whether they turn into conflict or coexistence. To understand how public perceptions toward wildlife fall along a continuum that ranges from conflict to coexistence, a case study is presented on wild boar and wild boar management. Data were collected through quantitative face-to-face interviews inside (n=399) and outside (n=402) Circeo National Park in central Italy. The majority of participants held positive perceptions of, and were tolerant toward, wild boar. However, the exploratory factorial analysis of variance emphasized that participants living inside the protected area hold stronger conservation values toward wild boar than those living outside, who were more concerned about how the species was managed. If wildlife managers fail to recognize that participants have different perceptions toward wildlife depending on where they live, they may apply strategies that foster conflict rather than coexistence. Choosing the "wrong" approach may lead to public rejection, rather than acceptance, of a species management plan. Only by better addressing conflict, and encompassing more

consistently positive interactions and tolerance between wildlife and local communities, will managers be able to promote positive perceptions toward wildlife and enhance public willingness to coexist with species.

Keywords: coexistence, damage perceptions, management options, boundary effect, protected area.

Introduction

Human societies have traditionally set aside land for its natural value (Possingham et al. 2006; Kothari 2008). From the early protection of natural areas for their sacred or hunting values to the establishment of the first formal national park, Yellowstone, in 1864, protected areas have proliferated over time (Possingham et al. 2006; West et al. 2006). Today, protected areas cover over 14% of the world's land surface (Naughton-Treves et al. 2005; Possingham et al. 2006; West et al. 2006; IUCN 2011). Protected areas have become a key tool for biodiversity preservation and are an internationally recognized mechanism to protect biodiversity (McNeely 1994; Kothari 2008; Treves 2009; IUCN 2011). However, land conservation has become insufficient to reduce human impacts on biodiversity (Naugthon-Treves 1999; Possingham et al. 2006; Ikpa et al. 2009). As conservation efforts often take place in environments heavily inhabited by humans, protected areas are no longer just biodiversity conservation tools; they are also laboratories of social, political, and economic interactions (West and Brockington 2006; West et al. 2006; Ogra 2008). Protected areas traditionally include human uses and settlements (Kothari 2008), and their establishment continues to affect "people living in

them, adjacent to them, and displaced by them" (West et al. 2006, p. 252). Protected areas may restrict land and resource use, change user rights, and create new power relationships between conservation authorities and local communities (Mbaiwa 2005; Kothari 2008). Such areas are not separate from people; they are enclosed in social contexts and shaped by social interactions (West et al. 2006; West and Brockington 2006). In fact, the conservation success of protected areas is as much about reducing human impact on biodiversity as it is about acknowledging and including people and their relationships to the protected land (McNeely 1994; Mascia et al. 2003; West et al. 2006; Kothari 2008).

Today, the important role played by humans in biodiversity preservation is widely recognized in conservation (Naughton-Treves 2005; Possingham et al. 2006; Kothari 2008; Hawken and Granoff 2010). Although the traditions and livelihoods of local communities tend to be considered in protected areas management today, the actual involvement of the people living in and around these areas remains slow and patchy (Pimbert and Pretty 1995; Kothari 2008; Hawken and Granoff 2010). Designing, establishing, and managing protected areas often remains a government practice carried out by centralized bureaucracies (Pimbert and Pretty 1995; Kothari 2008; Ikpa et al. 2009). The public tends to see protected areas as wildlife protection sites (Pimbert and Pretty 1995; Sekhar 2003; Ikpa et al. 2009). Thus, hostility toward the areas arises when people feel priority is given to wildlife over local community needs (Madden 2004a; Kothari 2008; Ikpa et al. 2009). Conservation practices that exclude or limit the role played by local communities in the decision-making process also promote conflicts

(Messmer 2009; Mascia et al. 2003). Such conflicts may be made even more tangible by wildlife conservation policies that focus on whether people and wildlife are inside or outside a protected area boundary (Grant and Quinn 2007; Falcucci et al. 2008). While species travel inside and outside the boundaries of protected areas, and the challenges of managing wild species inside and outside are similar, mechanisms to address these rising human-wildlife interactions on opposite side of park boundaries are often lacking (Naughton-Treves 1999; Bath and Enck 2003; Osborn and Hill 2005). People living inside parks are subject to different legislative rules and management authorities than those living outside. For example, the public outside the boundary who seek reimbursement for wildlife damages often face different legislative processes, time scales, and interest in their concerns (West and Brockington 2006; Falcucci et al. 2008). Conflict over wildlife management and challenges of reimbursement for wildlife damages can transform protected areas and their borderlands into places of tension (Madden 2004a; Manfredo et al. 2009). These areas are therefore ideal locations in which to investigate how public perceptions toward species arise and turn into conflict or coexistence.

To understand how human-wildlife interactions turn into conflict or coexistence in protected areas and their borderlands, a case study on public perceptions toward wild boar (*Sus scrofa*) and wild boar management was carried out in and around Circeo National Park, central Italy. In the next sections, the specific objective of this paper – to understand if people's willingness to coexist (or not) with wild species differs depending on whether participants live inside or outside the national park boundary – is investigated. Afterwards, differences in support and opposition toward management options are

explored by location, as often, wildlife management and conservation policies deal with wildlife impacts based on where the human-wildlife interactions occur. Understanding these differences will help managers choose and apply management and conservation techniques that increase public tolerance toward protected areas and foster coexistence. By promoting management strategies that are widely supported by residents living inside and outside protected areas, managers will be able to maintain and enhance positive perceptions toward wildlife, thus increasing public willingness to share the landscape with wild species (Mangun et al. 2009; Peterson et al. 2010).

For some, the discussion of conflict or coexistence may be a matter of semantics. In terms of working toward solutions, concentrating on mechanisms of coexistence is more positive than mitigating conflicts (Madden 2005b; Peterson et al. 2010). However, shifting from a study of conflict to a study of coexistence may be not enough. There is a need to consider conflict and coexistence as they relate to each other. The conclusions of this paper focuses on the idea of conflict and coexistence sitting at opposite ends of a continuous line; this concept helps demonstrate how managers can reduce conflict while fostering positive perceptions toward wildlife in protected areas and their borderlands. Addressing conflict and practicing coexistence represents a transferable and innovative way to engage the public in wildlife and protected areas conservation and management. With the increase of human-modified landscapes and more people living inside protected areas, there is a need for a new conservation strategy that can more effectively address conflict and coexistence and integrate people in the design, establishment, and management of protected areas.

Methods

Study site

Circeo National Park, with a surface of 85 km^2 and a buffer zone[3] of 2 km around the protected area, is situated along the Tyrrhenian shores of southern Lazio region, halfway between Rome (112 km) and Naples (148 km) in central Italy (Giagnacovo and Tomassini 2003). While most Italian parks are centered on the high mountains of the Alps and the Apennines, this protected area occupies a coastal plain zone (Zerunian 2005). Along with remarkable archaeological remains, protects a rich group of natural habitats (Zerunian, 2005). It holds 3,300 ha of the relict lowland forest Selva di Terracina (Terracina wild forest). In addition, the protected area includes the promontory of Circeo, which is a biome characterized by Mediterranean maquis and 220 meters of coastal sand strip with dunes covered by maquis shrubland and short vegetation (Zerunian, 2005). The unique vegetation mosaic of sandy beaches, coastal lakes, wetlands, dunes, and lowland forest have favored the establishment of a rich fauna in the park (Zerunian, 2005). Of the 1,237 species present in this area, 250 are bird species; this protected area is positioned along one of the main migratory bird routes of Italy (Zerunian, 2005). Established as the first national park in the Lazio region for conserving, preserving, increasing the value of the natural environment, and fostering the development of tourism and sustainable

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3 The buffer zone is an extension of the Circeo National Park perimeter. It is mainly characterized by human modified landscapes, with less than 20% of territory covered by natural habitats. Different legal and management frameworks are in force inside Circeo National Park and the buffer zone. A detailed definition of the conservation purpose and economic development taking place in the buffer zone is currently missing.

practice (Zerunian 2005), this protected area has undergone significant human modifications in the last 80 years. The draining of the original marshland in the 1920s and 1930s, and the increase of agricultural land in and around this protected area, has resulted in the loss of natural landscapes and in an increase in rural settlements (Zerunian 2005). In 1927, there were 937 inhabitants in Circeo National Park and the buffer zone; today there is an estimated population of 149,842 (ISTAT 2001; Zerunian 2005). Sabaudia, with 17,171 residents, and San Felice Circeo, with 8,218 residents (ISTAT 2001), are the major towns found inside the boundaries and in the buffer zone of this protected area. The agricultural landscape (18% of the park territory) has become a characterizing element of this national park over time (Giagnacovo and Tomassini, 2003). Currently, 11% of Circeo National Park territory is farmed with cereals and grass, another 5% is used as meadow for livestock grazing, and a further 2% is employed to grow vegetables, olives, and fruit (Giagnacovo and Tomassini, 2003). Around the park boundaries, 80% of the territory is agricultural land or human settlement. Agriculture activities play an important role in the economic development of this area. Such activities are mainly carried out for commercial purposes in and around this park.

Circeo National Park and the buffer zone enclose 149,842 residents, human-shaped environments, a mosaic of natural habitats, and a rich fauna. Such a diverse landscape has led to the increase in number and home range of wild boar in and around the park. Despite there being a lack of information about the species' abundance per square kilometre on the Italian territory, data are available for protected areas with active control programs of wild boar. As Circeo National Park has carried out wild boar population

control since 1990, population density has been estimated for this area: nine to eleven wild boars are present per square kilometer inside the park, its buffer zone, and surrounding territories (Amici and Serrani 2004; Monaco et al., 2010). Such population density is most likely due to the lack of natural predators and the presence of abundant natural and anthropogenic food sources for wild boar.

Growing wild boar populations are leading to increasing damages to vehicles, crops and other human property in Circeo National Park. To reduce such impacts, a series of management strategies, such as compensation, preventive methods, and wild boar population control have been applied. For example, capture and removal of the species has been carried out inside this protected area (Monaco et al., 2010). As wild boar is both an important game species and a pest for agriculture, conflicts over how to manage wild boar have arisen and are escalating between local communities and conservation authorities. Disagreements over wild boars are often made worse by the different legal frameworks and management approaches in force in the national park and its buffer zone. Since controversies over wild boar management are at an early stage in Circeo National Park, this area lends itself nicely as a case study to explore how public perceptions toward species are shaped and turned into conflict or coexistence.

Data collection and analysis

To obtain a sample best representing the communities living in Circeo National Park and the buffer zone, stratified random sampling proportional to each township's population was applied (Sheskin 1985; Hall and Hall 1996; Vaske 2008; Warne 2008).

Data on community populations were calculated from the most recent national census data (Istituto Nazionale di Statistica [ISTAT] 2001). Data were collected by administering personal structured interviews to 399 participants living inside (response rate = 53%) and 402 outside (response rate = 52%) Circeo National Park. A closed-ended questionnaire was administered through face-to-face interviews at the respondent's place of residence; this excluded occasional users of the park. Depending upon the level of interest of participants, the length of the interview varied from 15 to 30 minutes. Data were collected between June and August 2008.

Respondents were asked to rate their negative to positive perceptions toward wild boar by making a "cross" along a continuum ranging from conflict (0 cm) to coexistence (12 cm). The response on the continuous line was measured as the distance from the left end-point to the participant's cross. Measurements were made with a ruler and had an accuracy of 0.05 mm. Questions about the value of wild boar for future generations, the right of wild boar to exist, the need to totally protect wild boar, the impacts caused by the species, and trends of damages by wild boar in the area were instead explored with a five-point scale ranging from strongly disagree (1) to strongly agree (5). Respondents also indicated on a five-point scale their level of opposition (1) or support (5) toward: (a) increasing the compensation for wild boar-related damages; (b) decreasing wild boar populations; (c) capturing and releasing wild boar into other areas; (d) selective killing of wild boar inside the park; and (e) providing opportunities to observe wild boar inside the park.

Exploratory statistics were carried out using the software SPSS version 17 (SPSS 2008). No socio-demographic differences were found between participants living inside and those living outside the protected areas. Mean and standard deviation of items concerning conservation values toward the species, agricultural impacts, and possible management options were performed separately for the two groups. To explore how the variables in this study were related to each other, and if such a relationship would differ between people living inside or outside the protected area, an exploratory factor analysis was carried out. The scree plot and eigenvalue scores of the exploratory factor analysis from the maximum likelihood extraction (about equal to or greater than 1) were used to extrapolate factors accounting for the variance. For better interpretation of the individual components, the loadings below 0.30 were omitted from further analysis (Tabachnick and Fidell 2001). To test for differences between these two respondent groups, an independent t-test was carried out for all questions reported in the section above. A significance level of $p < 0.05$ was used (Fowler et al., 1998; Vaske 2008). To avoid generating significant findings with little practical utility, the sample size effect was estimated through Cohen's d (see Vaske, 2008). For this analysis, effect size was considered a minimal relationship when $d \leq 0.2$, a typical relationship when $0.21 \leq d \leq 0.79$, and a substantial relationship when $d \geq 0.80$ (Vaske 2008).

Results

People living in and around Circeo National Park were asked to express their perceptions toward wild boar by marking an X along a line that represented a range from conflict (0 cm) to coexistence (12 cm). No matter where they lived, most participants

expressed perceptions of coexistence toward the species (inside: $\bar{x}$= 8.71, SD= 3.18; outside: $\bar{x}$= 8.21, SD= 3.3) (Figure 8.1). By displaying the scores obtained by measuring participants' answers along the conflict-coexistence continuum in a line graph, differences between the two groups were visible only toward the midpoint and the coexistence end of the continuum.

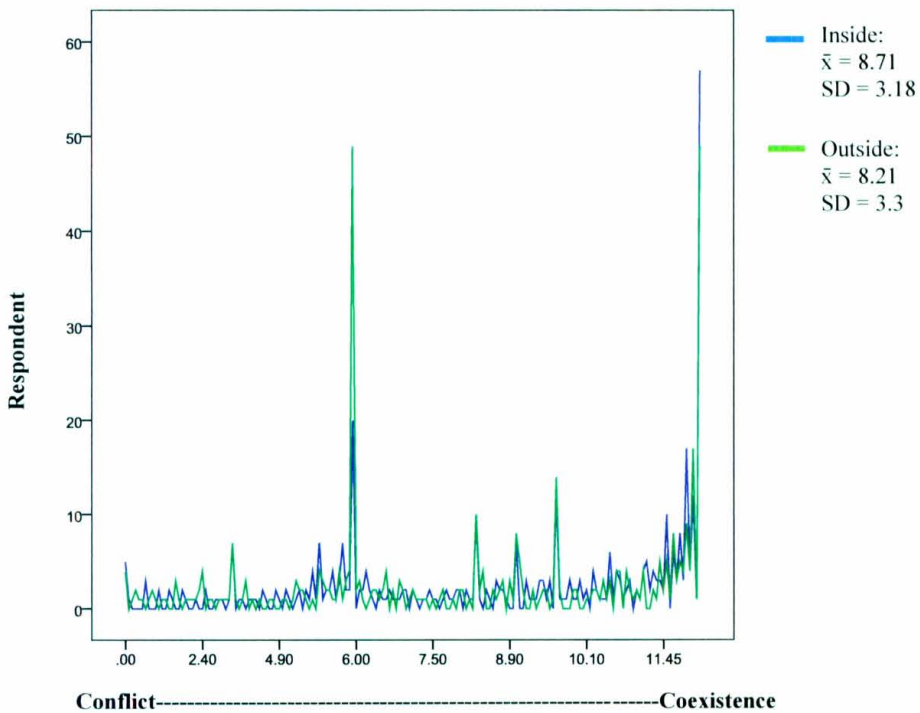


Figure 8.1. Line graph of the scores obtained by measuring with a ruler to an accuracy of 0.05 mm where participants put the X sign along the conflict-coexistence continuum. Mean ($\bar{x}$) and standard deviation (SD) are reported for the continuous line used to explore conflict (0 cm) to coexistence (12 cm) perceptions toward wild boar of participants living inside and outside Circeo National Park.

On the five-point scale ranging from strongly disagree (1) to strongly agree (5), respondents recognized that wild boar had value for future generations (inside: $\bar{x}$= 4.01, SD= 0.65; outside: $\bar{x}$= 3.86, SD= 0.64), had an existence right (inside: $\bar{x}$= 4.05, SD= 0.54; outside: $\bar{x}$= 3.91, SD= 0.55), and should be protected inside designated areas (inside: $\bar{x}$= 3.62, SD= 0.99; outside: $\bar{x}$= 3.43, SD= 1.01). Exploratory analysis also highlighted that participants did agree with the statement that wild boar cause abundant damages to agriculture (inside: $\bar{x}$= 3.32, SD= 0.95; outside: $\bar{x}$= 3.58, SD= 0.97) and that wild boar damages are increasing inside the protected area (inside: $\bar{x}$= 3.34, SD= 1.02; outside: $\bar{x}$= 3.06, SD= 1.13).

To further explore participants' perceptions toward wild boar, support and opposition toward different wild boar management practices were investigated. The majority of participants were supportive of an increase in compensation for damages caused by wild boar (inside: $\bar{x}$= 3.28, SD= 1.03; outside: $\bar{x}$= 3.42, SD= 0.98) and toward enhancing the opportunities of viewing wild boar inside the park (inside: $\bar{x}$= 3.86, SD= 0.91; outside: $\bar{x}$= 3.82, SD= 0.79). Most participants, no matter where they lived, did not support or were neutral to the idea of park managers decreasing wild boar populations inside the park (inside: $\bar{x}$= 2.25, SD= 1.45; outside: $\bar{x}$= 2.57, SD= 1.18). Such attitudes were further underlined by participants' low support toward the relocation of animals to other areas (inside: $\bar{x}$= 2.56, SD= 1.04; outside: $\bar{x}$= 2.81, SD= 1.04) or the selective killing of wild boar inside Circeo National Park (inside: $\bar{x}$= 2.47, SD= 1.14; outside: $\bar{x}$= 2.7, SD= 1.13).

To investigate conflict and coexistence perceptions across the protected area boundary, and to better understand the differences detected through the mean and standard deviation of the items considered, an exploratory factor analysis was run to identify key components for respondents living inside (Table 8.1) and outside (Table 8.2) Circeo National Park. Four clear components inside and three outside emerged from the exploratory factor analysis for the two groups. For those living inside the protected area, the first component represented conservation values with a variance of responses among attitudinal items of 24.0%. Four items loaded on this component ranging from 0.419 to 0.832. The second component, with three items ranging from 0.828 to -0.612, represented management options and accounted for an additional 14.0% of variance. The other two components represented damages (12.8%), ranging from 0.829 to -0.760, and tolerance (9.9%), ranging from 0.773 to -0.688. Collectively, all four components explained 60.7% of the total variance.

Table 8.1 Exploratory factor analysis carried out for respondents living inside Circeo National Park (central Italy) on perceptions toward wild boar, damages caused by the species, and possible management options to reduce the impact of wild boar. Varimax with Kaiser Normalization. Only items with loadings greater than the absolute value 0.3 are included in the table.

Items	Component			
	Conservation	Management	Damages	Tolerance
Conflict-Coexistence		.		-.688
Future generation value	.810			
Existence value	.832			
Total protection inside protected area	.419	-.612		
Wild boar causes abundant damages to agriculture				.408
Increasing wild boar damages to agriculture			-.829	
Increase compensation				.773
Capture and release		.828		
Selective killing		.799		
Increasing viewing opportunities	.581			
Decreasing wild boar populations inside protected area			.760	

In contrast, outside the protected area management options were the most important component, accounting for 24.6% of the variation. Four items loaded on this component ranging from 0.842 to -0.642. The second component, consisting of five items loading from 0.797 to - 0.353, represented conservation value and accounted for 13.5% of the

variance. The last component was represented by damages (11.3%) and ranged from 0.714 to - 0.776. The three components explained 49.3% of the variance. By comparing the exploratory factor analysis obtained for participants living inside versus outside Circeo National Park, a switch in importance of conservation values and management options becomes clear between these two groups.

Table 8.2 Exploratory factor analysis carried out for respondents living outside Circeo National Park (central Italy) on perceptions toward wild boar, damages caused by the species, and possible management options to reduce the impact of wild boar. Varimax with Kaiser Normalization. Only items with loadings greater than the absolute value 0.3 are included in the table.

Items	Component		
	Management	Conservation	Damages
Conflict-Coexistence		.471	
Future generation value		.797	
Existence value		.744	
Total protection inside protected area	-.642		
Increasing wild boar causes abundant damages to agriculture	.458		
Wild boar damages to agriculture			.714
Increase compensation		-.353	
Capture and release	.835		
Selective killing	.842		
Increasing viewing opportunities		.513	
Decreasing wild boar populations inside protected area			-.776

To understand if the similarities and differences across perceptions and space detected through the exploratory statistic and factor analysis were significant, an independent sample t-test was run for the items mentioned above. No significant differences were detected for the items on perceptions of conflict and coexistence, total protection of the species, and increased compensation and viewing opportunities (Table 8.3). However, the independent t-test revealed statistical differences between people living inside and those living outside the protected area on future generation ($t= 3.287$; $p<0.001$; $d= 0.26$) and existence values ($t= 3.624$; $p<0.001$; $d= 0.23$). People living inside the park hold stronger conservation values than those living outside. There were also differences between the two groups in beliefs about whether wild boar cause abundant damage ($t= -3.879$; $p<0.001$; $d= -0.27$), and whether that damage was increasing ($t= 3.737$; $p<0.001$; $d= 0.26$). These differences were not due to large sample size (Table 8.3). Further differences between the groups emerged about decreasing the wild boar population inside the park ($t= -3.353$; $p<0.001$; $d= -0.24$), about the capture and release of the species ($t= -3.387$; $p<0.001$; $d= -0.24$) and about selective killing of wild boar ($t= -2.960$; $p<0.005$; $d= -0.25$) (Table 8.3). Those living outside the park were more supportive toward wild boar population control than respondents living inside Circeo National Park.

Table 8.3: Independent t-test group statistic and effect size indices Cohen's d of perceptions toward wild boar, perceptions of damages and management options items for respondents living inside and outside Cireco National Park.

Items	t-test	df	p	d
Conflict-Coexistence	2.205	799	.028	0.13
Future generation value (I > 0)	3.287	799	<0.001	0.23
Existence value (I > 0)	3.624	799	<0.001	0.26
Total protection inside protected area	2.661	799	.008	0.19
Wild boar causes abundant damages to agriculture (I < 0)	-3.879	799	<0.001	-0.27
Increasing wild boar damages to agriculture (I > 0)	3.737	791	<0.001	0.26
Increase compensation	-2.066	799	.039	-0.15
Capture and release (I < 0)	-3.387	799	<0.001	-0.24
Selective killing (I < 0)	-2.960	799	<0.003	-0.21
Increasing viewing opportunities	0.810	799	.418	0.06
Decreasing wild boar populations inside protected area (I < 0)	-3.353	765	<0.001	-0.24

Discussion

By investigating how responses varied across space, we found that participants hold generally positive perceptions of wild boar. They displayed a high degree of willingness to coexist with wild boar, independently of being inside or outside the protected area. Most participants were in favor of total protection of the species in designated areas, increasing compensation for wild boar damages, and providing more viewing opportunities of the species. While people's tolerance of and willingness to coexist with

the species was the same across the protected area boundary, differences in perceptions of damages and support toward wild boar management were identified between people living inside and outside Circeo National Park. Specifically, participants living inside the protected area tended to hold stronger conservation values toward wild boar than those living outside the park, who were more concerned about how the species would be managed. High tolerance toward the species might be explained by the fact that people have coexisted and interacted with wild boar long before the designation of the protected area. Thus, people living inside and outside the protected areas did not hold dissimilar perceptions toward the species per se. The establishment of the national park and the consequent development of protected area policies, however, have likely shaped differences in perception. The diverse economic role played by agriculture and the inconsistent territorial laws and strategies in force inside and outside the park to manage wild boar damages explains the switch in priorities between people living inside and outside Circeo National Park. Consequently, the management of wild boar impacts based on the geographical location in which people interact with the species (e.g., inside versus outside the protected area) has led to the generation of a boundary between the protected area and its buffer zone. This boundary effect is clearly highlighted by the switch in conservation and management priorities between people living inside and outside the protected area.

Protected area boundaries do not only influence the physical and ecological features present inside a natural area (Huber et al. 2010; Heras et al. 2011), they also shape participants' perceptions and management views toward wildlife (Landres et al. 1998;

Johansson 2008). This is particularly true when park authorities manage protected areas like isolated islands (West and Brockington 2006). To overcome such limitations, park authorities need to start thinking and acting outside the protected areas box, or to create a more flexible box that goes beyond policies, institutions, and administrative park boundaries (Landres et al. 1998; Treves and Karant 2003). To implement biodiversity preservation, protected areas borderlands should be considered in park management and conservation strategies. These areas represent important locations from which to explore perceptions of conflict and coexistence and thus to address wildlife management and conservation issues. In border zones, where there is an overlap between human and wildlife habitats, human-wildlife interactions are often more controversial as species and human communities are closer and compete over the same space and food sources (Woodroffe et al., 2005; West et al., 2006; Ogra, 2008; Johansson, 2008). Borderlands of protected areas therefore become places of tension as the public interfaces and collide with conservation authorities on how wildlife should be managed or conserved (Madden, 2004a; Manfredo et al., 2009). By engaging and sharing responsibilities over wildlife management and conservation with people living in and around parks, a new protected area approach will take root and biodiversity conservation will become a more successful practice.

Management Implications

Unawareness or partial understanding of similarities and differences in public perceptions across protected area boundaries may lead managers to inefficiently allocate efforts and resources to deal with human-wildlife interactions. Not recognizing that most

participants are willing to coexist with wild boar, but envision wildlife conservation and management strategies depending on where they live, can lead managers to wrongly address human-wild boar challenges in Circeo National Park. For example, the strong conservation values expressed by participants living in the park make wild boar population control (e.g., capture and killing of wild boar) inside the protected area a controversial management practice. This may not be the case outside the park, where respondents clearly identified wild boar management as a priority. Inside the protected area, communication and education campaigns about the rationale and benefits of wild boar population control should be planned and carried out to raise awareness and minimize conflicts over this management strategy. Protecting the species in designated areas and providing preventive methods would represent management choices that foster coexistence in both the protected area and its borderland. For example, managers could reduce wild boar economic impacts on agricultural land by supplying structures such as fences and electric nets to those who have experienced crop damages. This approach would foster the direct involvement of people in building such structures, and make them responsible for keeping the preventive measure in operation. They could also increase wild boar viewing activities and educational efforts inside the park while managing the wild boar population outside of it with the help of local hunter groups. Such an integrated management approach would foster participants' positive perceptions toward the species and avoid transforming the current tolerance toward wild boar into a rejection of the species in and around the protected area.

Future research

Dealing with conflicts alone does not lead towards maximizing coexistence between people and wildlife. To work toward maintaining and enhancing positive perceptions and a public willingness to tolerate wildlife in their proximity, coexistence perceptions must be consistently included in wildlife management and conservation in protected areas and their borderlands (Mangun et al. 2009; Peterson et al. 2010). By examining conflict and coexistence along a continuum, as perceived by residents living in and around a protected area, this paper has addressed the gap of considering either positive or negative interactions while dealing with wildlife management and conservation. It has also gone a step further by putting forward the idea of conflict and coexistence as a continuous concept that ranges from a major conflict, to a small nuisance, to a slight tolerated annoyance, and finally to the integration and acceptance of wildlife within the human landscape.

The lack of literature and of a framework that considers conflict and coexistence for the same topic and in borderlands of protected areas has represented a limitation to the further development of this idea. To really understand how the public's negative to positive perceptions toward species can shift along this newly designed conflict-coexistence continuum, a framework that better defines the term coexistence and redefines human-wildlife interactions as both conflict and coexistence should be developed. This new definition will help conservation authorities better investigate the reasons behind negative to positive perceptions toward wildlife. As human-wildlife interactions are often complex and multidimensional, an interface between society,

culture, and conservation should be part of this ideal framework. Borderlands of protected areas could represent a key location to investigate a newly designed framework, as people living in these areas of tension often play a fundamental role in determining whether a conservation project will be successful. While conflict to coexistence perceptions are related to the specific context in which studies are carried out (e.g. people living inside or outside Circeo National Park), the idea of conflict and coexistence along a continuum can be beneficially applied for different species, geographical locations, cultures, and protected areas. The framework would enable researchers to replicate and implement the study carried out for this paper in other places and for other species. By better addressing conflict, and by encompassing more consistently positive interactions and tolerance between wildlife and local communities in wildlife management and conservation, a better relationship between humans and wildlife can be fostered. The goal is to reach a point at which people and wildlife can share the same landscape for the long term.

References

Amici, A., and F. Serrani. 2004. *Linee guida per la gestione del cinghiale (Sus scrofa) nella Provincia di Viterbo.* Università della Tuscia, Dipartimento di Produzioni Animali - Provincia di Viterba, Assessorato Agricoltura, Caccia e Pesca.

Bath, A. J., and J. W. Enck. 2003. Wildlife-human interactions in National parks in Canada and the USA. *NPS Social Science Research Review*. 6, 1-32.

De Stefano, S., and R. Deblinger. 2005. Wildlife as valuable natural resources vs. intolerable pests: a suburban wildlife management model. *Urban Ecosystems*. 8: 179–190.

Falcucci, A., L.Maiorano, P. Ciucci, E. O. Garton and L. Boitani. 2008. Land-cover change and the future of the Apennine brown bear: a perspective from the past. *Journal of Mammalogy*. 89: 1502-1522.

Giagnacovo, G., and A. Tomassini. 2003. *Progetto "Parchi in qualità" ovvero "applicazione pilota del Sistema di Gestione Ambientale nelle aree naturali protette" Realizzazione della Carta dell'Uso del Suolo del Parco Nazionale del Circeo e Aree Limitrofe.* Ministero dell'Ambiente e del Territorio and ENEA.

Grant, J. A., and M. S. Quinn. 2007. Factor influencing transboundary wildlife management in the North American "Crown of the continent". *Journal of Environmental Planning and Management*. 50: 765-782.

Hall, D., and I. Hall. 1996. *Practical Social Research: project work in the community*. Macmillan Press LTD, Malaysia.

Hawken, I. F., and I. M. E. Granoff. 2010. People in Parks—Beyond the Debate. *Journal of Sustainable Forestry*. 29:110–121.

Heras de las P., P.Fernández-Sañudo, N.López-Estébanez, and M. J. Roldán. 2011. Territorial dynamics and boundary effects in a protected area of the Central Iberian Peninsula. *Central European Journal of Geosciences*. 3 (1): 1-11.

Huber, P. R.., S. E. Greco, and J. H. Thorne. 2010. Boundaries Make a Difference: The Effects of Spatial and Temporal Parameters on Conservation Planning. *The Professional Geographer*. 62 (3): 409-425.

Ikpa, T. F., B. A. Dera, and J. A. Jande. 2009. Biodiveroty conservation: why local inhabitants destroy habitat in protected areas. *Science World Journal*. 4 (4): 22-27.

ISTAT. 2001. Rapporto annuale 2001. www.istat.it.

IUCN. 2011. IUCN's Global Protected Area Programme. http://www.iucn.org/about/work/programmes/pa/

Johansson, T. 200). *Beasts on Fields. Human-Wildlife Conflict in Nature-Culture Borderlands.* Academic dissertation. Helsingin Yliopiston maantieteen laitoksen julkaisuja A145. Department of Geography, University of Helsinki. Hansaprint, Helsink.

Kothari, A. 2008. Protected area and people: the future of the past. *Parks.* 17(2): 23-34.

Landres, P. B., S. Marsh, L. Merigliano, D. Ritter, and A. Norman. 1998. *Boundary effects on wilderness and other areas.* Pages 117-139. In Knight, R. L., Landres, P. B., eds. (1998). Stewardship across boundaries. Covelo, CA. Island Press.

Mbaiwa, J. E. 2005. Wildlife resource utilization at Moremi Game Reserve and Khwai community area in the Okavango Delta Botswana. *Journal Environmental Management*. 77: 144-156

Madden, F. 2004a. Creating coexistence between humans and wildlife: global perspectives on local efforts to address human-wildlife conflict. *Human Dimensions of Wildlife*. 9: 247-257.

Madden, F. 2004b. Can traditions of tolerance help minimize conflict? An exploration of cultural factors supporting human-wildlife coexistence. *Policy Matters*. 13: 234-241.

Manfredo., M., J., J. J. Vaske, P. J. Brown, D. J. Decker, and E. A. Dike. 2009. *Wildlife and society: the science of human dimensions*. Island Press, Washington, DC.

Mangun, M. C., C. A. Degia, and M. A. Davenport. 2009. Neighbors yet stranger: local people's awareness of Cypress Creek National Wildlife Refuge, Southern Illinois, USA. *Society and Natural Resources*. 22: 295-307.

Mascia, B. M., J. P. Brosius, T.A. Dobson, B. C. Forbes, L. Horowitz, M. A. Mc Kean, and N. J. Turner. 2003. Conservation and the Social Sciences. *Conservation Biology*. 17: 649-650.

McNeely, J. A. 1994. Protected areas for the 21st century: working to provide benefits to society. *Biodiversity and Conservation*. 3: 390-405

Messmer, T. A. 2000. The emergence of human-wildlife conflict management: turning challenges into opportunities. *International Biodeterioration and Biodegradation*. 45, 97-102.

Monaco A., Carnevali, L. and S.Toso, 2010. *Linee guida per la gestione del cinghiale (Sus Scrofa) nelle aree protette. 2^{a} edizione*. Quaderni Cinservazione della natura, 34. Ministero ambiente-I.S.P.R.A.

Naughton-Treves, L. 1999. Whose animals? A history of property rights to wildlife in Toro, Western Uganda. *Land Degradation and Development*. 10, 311-328.

Naughton-Treves, L., M. Buck Holland, and K. Bardon. 2005. The role of protected area in conserving biodiversity and sustaining local livelihoods. *Annual Review of Environment and Resources*. 30: 219-252.

Ogra, M. V. 200). Human–wildlife conflict and gender in protected area borderlands: A case study of costs, perceptions, and vulnerabilities from Uttarakhand (Uttaranchal), India. *Geoforum.* 39: 1408–1422.

Osborn, F. V., and C. M.Hill. 2005. *Techniques to reduce crop loss: human and technical dimension in Africa.* In Woodroffe, R., Thirgood, S. and Rabinowitz, A. People and Wildlife. Conflict or coexistence. Cambridge University Press, Cambridge, UK.

Peterson, M. N., J. L. Birckhead, K. Leong, M. J. Peterson, and T. R. Peterson. 2010. Rearticulating the myth of human-wildlife conflict. *Conservation Letters*. 3: 74-82.

Pimbert, M. P., and J. N. Pretty. 1995. *Parks, People and Professionals: Putting `Participation' into Protected Area Management*. United Nations research institute for social development, international institute for environment and development World Wide Fund for Nature. Discussion Paper No 57. UNRISD, Geneva, Switzerland.

Possimgham, H. P., K. A. Wilson, S. J. Andelman, and C. H. Vynne. 2006. *Protected areas: goals, limitations and design.* In Groom, M. J., Meffe, G. K., Carroll, C. R., and contributors. Principles of Conservation Biology. Third Edition. Sunderland, Massachusetts, U.S.A.

Riley, S.J. and D.J. Decker. 2000. Wildlife stakeholder acceptance capacity for cougars in Montana. *Wildlife Society Bulletin*. 28, 931–939.

Sekhar, N.G. 200). Local peoples perception towards conservation and wildlife tourism around Sarika Tiger Reserve, India. *Journal of Environmental Management*. 69: 339-347.

Sheskin, I. M. 1985. *Survey research for geographers*. Association of American Geographers, Washington, D.C., USA.

Tabachnick, B. G., and L. S. Fidell. 2001. *Using multivariate statistics*. Fourth Edition. Needham Heights, MA: Allyn & Bacon.

Treves, A., and U. K. Karanth. 2003. Human-carnivore conflict and perspectives on carnivore management worldwide. *Conservation Biology*. 17, 1491-1499.

Treves, A. 2009. *The human dimensions of conflicts with wildlife around protected areas.* in: Manfredo, M. J., Vaske, J. J., Brown, P. J., Decker D.J., and Duke, E. A. Wildlife and society: the science of human dimensions. Island Press, Washington.

Vaske, J. J. 2008. *Survey research and analysis. Application in parks, recreation and Human Dimensions*. Venture Publishing, Inc., State Collage, Pennsylvania.

West, P., J. Igoeand and D. Brockington. 2006. Parks and Peoples: The Social Impact of Protected Areas. *Annual Review of Anthropology*. 35: 251-277

West, P., and D. Brockington. 2006. An Anthropological perspective on some unexpected consequences of protected areas. *Conservation Biology*. 20, 609-616.

Warner, R.M. 2008. *Applied Statistics: from bivariate through multivariate techniques*. SAGE Publications, Inc. U.S.A.

Zerunian, S. 2005. *Habitat, flora e fauna del Parco Nazionale del Circeo. Corpo Forestale dello Stato*. Ufficio Gestione Beni ex ASFD di Sabaudia.

9. Paper 3: Wildlife management: a tool to foster coexistence or to increase conflict between humans and wildlife?

Abstract

Around the Regional Nature Reserve Nazzano-Tevere-Farfa in Italy, controversy has emerged as human-wild boar conflicts have increased, creating the need for integrated wildlife management. Since 2006, park authorities have used an average of 22% of the yearly reserve budget for compensation and preventive measures to address the concerns of local residents regarding wild boar. Additionally, 266 wild boar were culled in the reserve in 2009 and 2010. To understand how integrated wildlife management strategies influence feelings toward wildlife, perceptions of conflict and coexistence, and attitudes toward preventive methods, compensation, and wild boar population control were explored among different users of the reserve. Face-to-face interviews were carried out with the general public (n= 288), hunters (n= 57), commercial farmers (n= 53), and subsistence farmers (n= 54) in 2009 and 2010. Differences in attitudes toward preventive methods ($\chi^2(12)=45.14$, $p<.001$), compensations ($\chi^2(12)=36.03$, $p<.001$), capture and removal ($\chi^2(12)=99.77$, $p<.001$), and culling ($\chi^2(12)=78.71$, $p<.001$) were highlighted by Chi-square analysis. However, the Potential for Conflict Index, a new graphic technique that facilitates the understanding and applicability of human dimension findings, showed that, overall, interest groups supported preventive measures and compensation systems. This was not the case for the capture and removal or culling of wild boar inside the reserve. Understanding the

different views held by residents helps identify which management options will be widely supported by local communities. This will help avoid the creation of controversial conservation programs, education or communication campaigns, which might lower public tolerance toward wildlife.

Keywords: integrated management, human dimension, wild boar, public involvement.

Introduction

As in other European countries, the wild boar (*Sus scrofa*) population in Italy has increased and expanded its home range in the last century (Sáez-Royuela and Telleriá 1986; Apollonio et al. 1988; Monaco et al. 2003; Carnevali et al. 2009; Scillitani et al. 2010). Wild boar reintroductions and human changes in habitat uses, along with the high reproductive rate and adaptability of the species, have enabled this ungulate to quintuple its geographical range in Italy in less than 30 years (Toso and Pedrotti, 2001; Massei and Genov, 2004). Today, wild boars are continuously distributed on 64% of the Italian territory; the population is estimated at 600,000 animals (Carnevali and Scacco 2009). The quick and massive recovery of the species since World War II has resulted in the return of wild boar to old and new territories, including human settlements (Schley and Roper 2003; Carnevali and Scacco 2009). Expanding wild boar populations have caused rising conflicts, as the species has started deteriorating natural environments, impacting other wildlife populations, and damaging human livelihoods and belongings (e.g., through vehicle collisions, damage to property, impact on agriculture) (Massei and Genov 2004; Monaco et al. 2010; Scillitani et al. 2010; Massei et al. 2011; Rossell et al.

2011). Wild boars have become a problematic species that requires management all over Italy, especially inside protected areas where it cannot be hunted (Monaco et al. 2003; Carnevali and Scacco 2009; Monaco et al. 2010; Rossell et al. 2011).

To address complex wild boar management challenges – damages caused to ecosystems, other wildlife species, and agriculture; vehicle collisions; and disease transmissions – integrated management strategies have been applied in Italy (Monaco et al. 2010; Massei et al. 2011). Specifically, park authorities have concurrently carried out a series of management strategies, including preventive methods (e.g., fences, electric nets, creation of artificial feeding sites), compensation for damages, and the selective killing of wild boar to reduce the impact of the species in and around protected areas (Monaco et al. 2010; Massei et al. 2011; Rossell et al 2011). Traditional management strategies that focus on the physical impact of wild boar on nature and people have often represented a constraint to the efficient management of wildlife (Messmer 2000; Mascia et al. 2003; Messmer 2009). By not considering that people attribute different emotional, mental, spiritual, social, cultural, and economic values to a species (Decker et al. 2001; Woodroffe et al. 2005), managers have often applied strategies that have raised controversy, rather than generated coexistence between humans and wildlife (Green et al. 1997; Siemer et al 2004; Bronner 2008; Dandy et al. 2011). For example, tensions over wild boar in and around protected areas have frequently become worse as managers have not recognized that this species can be perceived as ecologically important for wolf conservation (Meriggi and Lovari 1996; Apollonio 2004), as a "pest" that causes considerable damages (Linkie et al. 2007; Massei et al. 2011), and as an important game

species (Tsachalidis and Hadjisterkotis 2008; Toigo et al. 2009; Scillitani et al. 2010) – all at the same time.

Increased conflicts between local communities and protected area authorities in Italy have created the need to engage the public and their views in wildlife decision-making processes (Carnevali and Scacco 2010; Monaco et al. 2010; Glikman and Frank 2011). With this in mind, human dimension studies on wild boar have been carried out in Italy since 2003 (Panchetti 2003; Frassanito 2005; Rulli and Savini 2008; Carnevali and Scacco 2009; Pontuale 2009; Frank and Bath 2009; Frank and Bath 2010). The main theme of these studies has been to understand the attitudes of the general public or interest groups toward wild boar and its management (Panchetti 2003; Frassanito 2005; Rulli and Savini 2008; Carnevali and Scacco 2009; Pontuale 2009; Frank and Bath 2009; Frank and Bath 2010). Despite the need to include people in wild boar management throughout the decision-making process, human dimension efforts have been carried out as single case studies and have not resulted in public engagement in wildlife decision-making processes (Glikman and Frank 2011). Specifically, such approaches have not lead to the engagement of the public in species management or in the establishment of a legal decision framework about the species. Since human-wild boar conflicts in Italy have been recognized as more socio-political than biological in nature (Carnevali and Scacco 2009; Monaco et al. 2010), the limited involvement of local communities in wild boar management has often resulted in a lack of public trust and in an increase in hostility between park users and park authorities (Glikman and Frank 2011).

To start a dialogue and set the foundation for collaborative work between protected areas and local communities, a facilitated human dimension decision-making project was initiated by the Regional Park Agency Lazio (ARP) and Memorial University of Newfoundland (Canada). A case study area, the Regional Nature Reserve (RNR) Nazzano-Tevere-Farfa, was selected. As wild boar cause abundant damages and thus conflict between local communities and park authorities in Nazzano-Tevere-Farfa, this reserve is an ideal location to explore how the application of integrated management strategies can influence residents' perceptions toward wild boar. Management strategies, such as compensation, preventive methods, and wild boar population control have been simultaneously applied since 2006 in the reserve. However, the support or opposition of local residents toward such management strategies was not considered before implementing them. Rising concerns expressed by residents living outside the reserve about these strategies has created the need to explore negative to positive perceptions toward wild boar management. As suggested by the park authorities of the reserve, the general public, hunters, commercial farmers, and subsistence farmers were selected as key participants for the study. The participating hunters included only local wild boar and non-wild boar hunters. Subsistence farmers were defined as people farming an agricultural plot smaller than one square kilometre. Around the reserve, small farming plots are indeed used by residents to grow food for their own needs. Farmers with one square kilometre or more of cultivated land were categorized as commercial farmers as they would use the larger area to cultivate crops for economic profits. Participants without any particular interest or relationship toward the species were defined as the general public. The main objectives of this collaborative research project were: 1) to

collect information about participants' attitudes, beliefs, and perceptions toward wild boar; 2) to understand participants' support and opposition toward current wild boar management strategies; and 3) to identify possible conflicts between participants living around the reserve. To explore these objectives, and to start building trust between participants and park authorities, interviews with park users and encounters with local interest groups were carried out in 2009 and 2010. Additional qualitative data were collected during the meetings to help in interpreting the quantitative data obtained through the interviews, and to help identify conflicts between participants and park authorities over wild boar and its management. With this human dimension approach, the researcher aimed to better understand the views held by different park users towards wild boar and to set the foundations for future collaborative work between the protected area and local communities. As a new wild boar management plan will be designed by park authorities for 2011-2015, there is a need develop a shared and widely supported vision over wild boar management to avoid increasing conflicts in the reserve.

For the purpose of this paper, conflicts between park users (i.e., general public, hunters, commercial farmers, subsistence farmers) living around the RNR Nazzano-Tevere-Farfa were explored. The conflict to coexistence perceptions of participants, as well as their support and/or opposition toward preventive methods, compensation, and wild boar population control were investigated. Exploring conflict to coexistence perceptions helps in understanding if park users hold negative or positive attitudes toward wild boar, and thus whether they are prepared to tolerate the species in their proximity. It also enables managers to better characterize areas of disagreement and commonality

between interest groups on wild boar management. This understanding is necessary in order to recognize the reasons behind conflicts, to identify which management options are most widely supported by a larger section of society, and to promote management strategies that foster coexistence rather than conflict. All of these factors will help avoid the creation of conservation programs that apply controversial management options, and lower public tolerance toward wild species.

People directly affected by wildlife decide if they will support wildlife management options, if they will tolerate more or less animals and damages, and if they will coexist with species (Madden 2004a, b; Treves et al. 2006). Therefore, one-shot case studies are often not enough to really understand and efficiently address human-wildlife issues (Bath 1998; Bath and Majic 2001; Madden 2004a; Manfredo et al. 2009). There is a need to go further and plan management strategies that include people beyond the collection of public attitudes through a human dimension questionnaire (Jacobson and Duff 1998; Bath and Majic 2001). In this paper, a lack of public integration beyond the collection of baseline data is addressed for the first time in the Italian context by actively engaging interest groups in wild boar management decision-making processes. Furthermore, focusing on areas of disagreement and commonality between park users as a way to efficiently address conflict and enhance coexistence is an innovative way to look at human-wildlife challenges in Italy. By creating long-term partnerships between park authorities and local communities, public willingness to share the same landscape with wildlife and to coexist with wild species will be enhanced.

Methods

Study area

The RNR Nazzano-Tevere-Farfa is situated between the municipality of Rieti and Rome (central Italy), and covers a surface of 7.07 km^2. The Nazzano Lake and the rivers Farfa and Tiber cover 1.11 km^2 of this Ramsar international wetland site for migratory bird protection (D'Antoni and Lugari 2005). The natural landscape mosaic of the reserve includes wetland, reeds, forests, and cultivated fields. It is bounded by three villages: Nazzano (1,251 residents), Torrita Tiberina (932 residents) and Montopoli di Sabina (4,242 residents) (Istituto Nazionale di Statistica [ISTAT], 2001). No residents live inside the RNR Nazzano-Tevere-Farfa. Despite being surrounded by a landscape with dense human population, this protected area supports a rich fauna, including wild boar. Currently, fifteen wild boars per 1 km^2 are estimated for this area (ARP, 2010).

Over 40,000 Euro per year were allocated to compensate residents for damages caused by the growing and expanding wild boar populations in the RNR Nazzano-Tevere-Farfa between 2006 and 2009 (ARP, 2010). In these four years, an average of 17% per year of the total reserve budget was used for compensation; another 5% was allocated to provide preventive measures to farmers (ARP, 2010). To further reduce the impact on agricultural land and to protect the natural ecosystem inside the reserve, an average of 19 wild boars per km^2 in 2009 and 26 wild boars per km^2 in 2010 have been trapped and removed from the protected area by park rangers. A total of 266 wild boars have been culled inside the reserve in 2009-2010 (ARP, 2010). Despite the success of these measures in decreasing wild boar damages on agriculture and natural ecosystems

(ARP, 2010), conflicts have increased between local communities and protected area authorities, specifically over these practices.

Survey design and questionnaire

A random sampling proportional to each township's population was used to obtain a community sample that best represented the territory of Nazzano-Tevere-Farfa (Sheskin 1985; Hall and Hall 1996; Vaske 2008; Warner 2008). Data on community populations were calculated from the most recent national census (ISTAT, 2001). Close-ended questionnaires were administered face to face to 400 participants living around the reserve in 2009. At meetings organized by the reserve in 2010, another forty-six interviews were carried out with hunters, and six more with commercial farmers living around the reserve. In total, 288 members of the general public, 57 hunters, 53 commercial farmers, and 54 subsistence farmers were interviewed. The overall response rate was 75%.

To explore how negative to positive perceptions toward wildlife vary between interest groups, respondents were asked to rate their conflict-coexistence feelings toward wild boar on a continuous line that ranged from conflict (0 cm) to coexistence (13 cm). The line applied was 13 cm long to allow the addition of three breaks, one every 3.25 cm between the two extremes. In addition, attitudes toward wild boar management were explored among the different users of the reserve to understand which strategies should be applied to minimize conflict and maximize coexistence with wild boar in Nazzano-Tevere-Farfa. Specifically, interest groups indicated on a five-point Likert-type scale

their level of opposition (-2) or support (2) toward: (a) providing preventive methods; (b) increasing compensation for damages; (c) capturing and releasing wild boar into other areas; and (d) selective killing of wild boar inside the park.

To better understand the conflict to coexistence perceptions of interest groups over wildlife management in the reserve, a recorder kept notes of the discussions held during the 2010 meetings. The qualitative data obtained during these encounters were used to interpret the quantitative data collected in 2009 and 2010. Such qualitative data helped in better characterizing wild boar management issues in the reserve and in building "a complex, holistic word picture that explains or interprets detailed views of participants" (Creswell 1998, p. 15).

Data Analysis

Descriptive analyses on interest groups' conflict-coexistence perceptions toward wild boar were carried out to understand whether residents of the park held more negative or positive feelings toward the species around the RNR Nazzzano-Tevere-Farfa. A Chi-square was performed to examine if differences in support or opposition of wild boar management options were present between the general public, hunters, commercial farmers, and subsistence farmers in the reserve. To take into account possible large sample size effects, Cramér's V measures were reported for each comparison. V was considered for these analyses as a "minimal" relationship with values of 0.1, as a "typical" relationship with values of 0.30, and as a "substantial" relationship with values

of 0.50 and over (Vaske, 2008). All analyses were carried out using the software SPSS version 17 (SPSS 2008).

The preferences displayed by interest groups over wild boar management options were further explored with the Potential for Conflict Index (PCI), a newly designed graphic technique that enables researchers to facilitate the understanding and applicability of human dimension findings (Manfredo et al. 2003; Vaske et al. 2006; Vaske, 2008). Indeed, the PCI conveys information about the dispersion and the central tendency distribution of data in a bubble (Manfredo et al. 2003; Vaske et al. 2006; Vaske 2008). The size of the bubble represents the dispersion of the data and displays the degree of potential conflict over the acceptability of a specific action (e.g., how acceptable it is to cull wild boar). The values for PCI range from 0 to 1, where 0 indicates no conflict and 1 indicates maximum conflict. Thus, the bigger the bubble, the more potential conflict there is over a specific issue. The mean, or central tendency distribution of the data, is plotted on the Y-axis or neutral point of a rating scale. Depending on participants' response to a proposed management action, the bubble will be situated above the Y-axis, if the action is supported, or below it, if the management option is opposed (Vaske et al. 2006; Vaske 2008).

Results

Interest groups were requested to indicate their feelings toward wild boar on a continuous line that ranged from conflict (0 cm) to coexistence (13 cm). The general public ($\bar{x}$= 5.39, SD= 4.27), commercial farmers ($\bar{x}$= 5.89, SD= 4.19), and subsistence

farmers ($\bar{x}$= 4.37, SD= 4.86) expressed conflict feelings toward the species. Of these three groups, subsistence farmers were the least willing to coexist with wild boar. Only hunters expressed a high tolerance toward the species ($\bar{x}$= 8.41, SD= 4.79) (Figure 9.1).

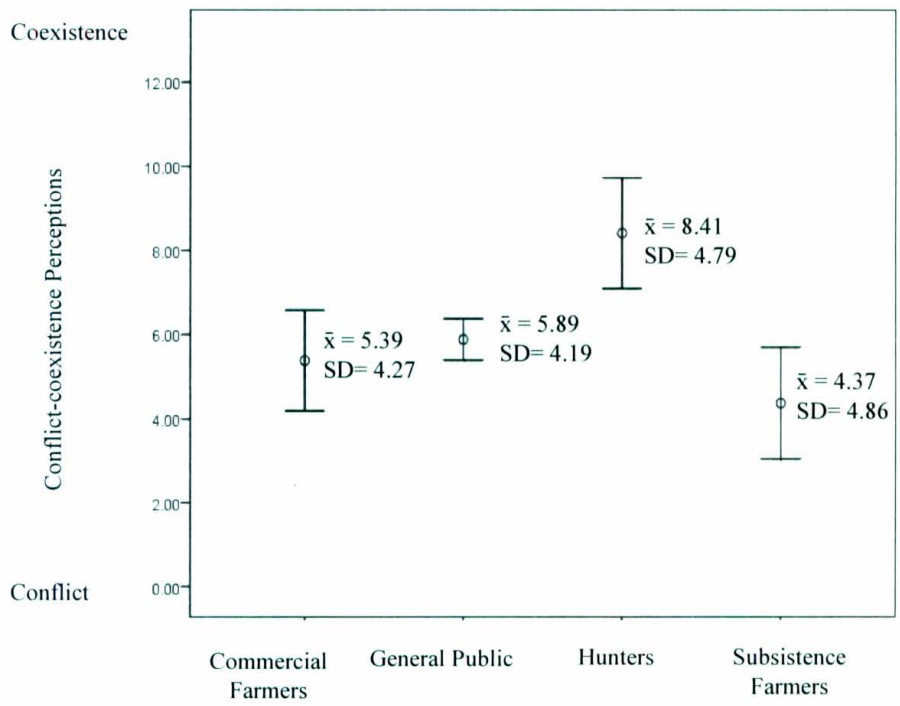


Figure 9.1 Scatterplot, mean ($\bar{x}$), and standard deviation (SD) for the scores obtained by measuring with a ruler to an accuracy of 0.05 mm, where participants put the X sign along the conflict-coexistence continuum line. Conflict (0 cm) to coexistence (13 cm) perceptions toward wild boar are reported for commercial farmers, the general public, hunters, and subsistence farmers living around the RNR Nazzano-Tevere-Farfa (central Italy).

Significant differences in attitudes toward providing preventive measures to farmers, increased compensation, capture and removal, and wild boar culls were found between the four interest groups (Table 9.1). Since differences between the groups were

not due to the sample size, the PCI index was used for each group across the wild boar management options explored with the Chi square statistic (Figure 9.2).

Table 9.1 Chi square statistic and effect size index for attitudes toward wild boar management options between the general public, hunters, commercial farmers, and subsistence farmers in the RNR Nazzano-Tevere-Farfa.

Item	$\chi 2$	df	p-value	Cramer's V
Providing preventive measures	45.14	12	<.001	0.184
Increase compensations	36.03	12	<.001	0.165
Capture and Remove	99.77	12	<.001	0.275
Culling	78.11	12	<.001	0.243

The general public (PCI=0.1), commercial farmers (PCI=0.15), and subsistence farmers (PCI=0.04) supported the idea of providing preventive measures to reduce wild boar damages as a management tool. Despite being in favour of this management option, hunters were less homogenous in their responses and less supportive than the other three groups of providing fences and other materials to reduce wild boar impacts (PCI=0.29). The same pattern is repeated for the item regarding increasing compensation: the general public (PCI=0.12), commercial farmers (PCI=0.14), and subsistence farmers (PCI=0.13) were totally in favour, while hunters (PCI=0.25) were less homogenously supportive toward compensation for wild boar damage. Differences between interest groups become more evident regarding the capture and removal of wild boar from the park. With a small bubble over the neutral point, commercial farmers (PCI=0.14) and subsistence farmers (PCI=0.15) welcomed the idea of a possible reduction in wild boar populations through

this management strategy. The general public (PCI=0.37), however, was quite divided in opinion about this management option. Still, the general public was more likely to accept wild boar capture and removal programs than hunters (PCI=0.49), who expressed no support, as shown by the big bubble under the neutral axis. Participants also expressed controversial attitudes toward culling the species inside the protected area. While support toward this practice was less homogenous than for previous management options, commercial farmers (PCI=0.27) and subsistence farmers (PCI=0.2) were still positive toward this mechanism to decrease wild boar numbers. Hunters (PCI=0.63) were more neutral toward culling wild boar. However, the large size of the bubble represents a high degree of potential conflict among hunters over this management option, highlighting that hunters are less cohesive as a group in their opinion about this topic. Low support toward killing the species inside the protected area was expressed also by the general public (PCI=0.42).

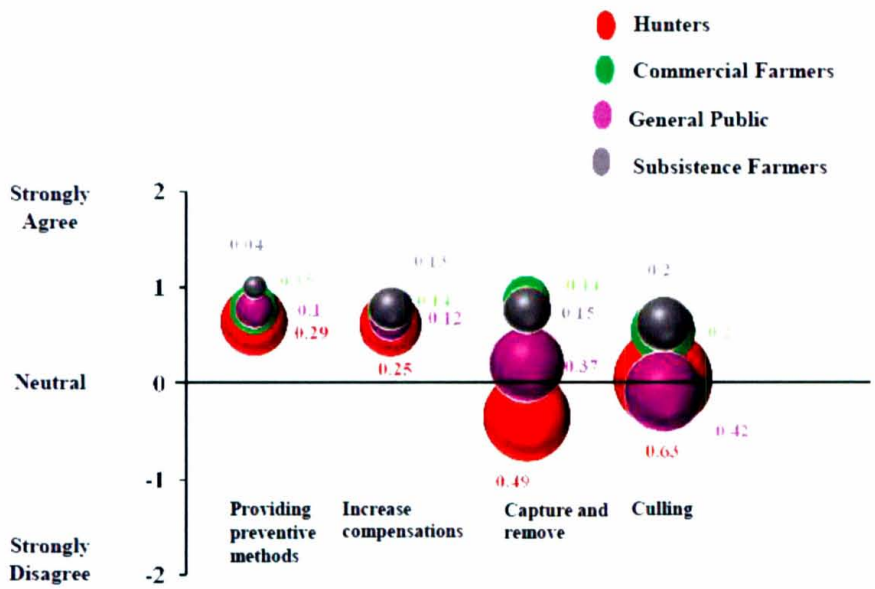


Figure 9.2 . Graphic representation of the Potential for Conflict Index (PCI) for the general public, commercial farmers, subsistence farmers, and hunters on support and opposition toward wild boar management options. Scores near each bubble represent the PCI value.

Discussion

In the last year, the Nazzano-Tevere-Farfa territory has experienced a reduction in damages to natural ecosystems and agricultural lands caused by wild boar thanks to the application of integrated management strategies (ARP, 2010). Through wild boar population control, the species density has been reduced inside the protected areas, leading to a decrease in impacts to aquatic birds and in compensation payments from the park to the public living in and around Nazzano-Tevere-Farfa. These positive

management outcomes have, however, not lead to widespread coexistence attitudes toward wild boar in the study area. Despite the reduction in wild boar impacts, the general public, commercial farmers, and subsistence farmers still hold negative feelings toward the species. These interest groups expressed negative feelings toward wild boar as they perceived this animal as a pest species that causes abundant damage to agricultural crops and people's belongings around the reserve. Hunters were clearly on the coexistence side of the conflict-coexistence continuum. Such positive feelings were due to the fact that wild boar represents one of the most important and appreciated hunting species in the territory of Nazzano-Tevere-Farfa. As also highlighted by the qualitative data collected during the meetings, the impacts (e.g., agricultural crop damages, wild boar-vehicle collisions) and the benefits (e.g., game hunting) experienced by participants, as well as the management strategies applied by the reserve for this species (e.g., compensation, preventive measures, population control) played a fundamental role in influencing conflict to coexistence feelings toward wild boar in Nazzano-Tevere-Farfa.

Differences in park users' tolerance perceptions toward wild boar were further reflected in their opinions over how the species should be managed inside the RNR Nazzano-Tevere-Farfa. Commercial farmers and subsistence farmers, being the groups most impacted by wild boar damages, supported all management strategies as long as the approaches selected reduced wild boar economic impacts on agricultural land. While the general public was in favour of providing preventive methods and increasing compensation to manage wild boar damages, they did not like methods that directly impacted wild boar numbers. Existence value, animal rights, and mistrust about how the

park would carry out wild boar population control inside the area, are some of the reasons behind such opposition. Strong community relationships and daily interactions between the general public and the local hunters may also explain why the general public is against wild boar population control. Despite having a less homogeneous opinion as a group about how the species should be managed inside Nazzano-Tevere-Farfa, hunters were supportive of providing preventive methods and increasing compensation. However, capture and release and culling the species inside the park represented controversial topics for this group since these practices subtract game from hunters and impact their ability to hunt wild boar in the areas surrounding the reserve. Hunters were more opposed to the capture and release of wild boar inside the park than they were to a cull, as they are not involved in trapping and removing wild boar in the reserve. Capture and release activities were perceived as more controversial as hunters would like to participate to this practice to monitor how many animals are subtracted per session from the reserve. On the other hand, hunters can legally participate in selective killing organized by park rangers inside protected areas if they hold a specific license for this activity. Thus, more neutral feelings were expressed by this group toward culling as this activity can be monitored and supervised by hunters. For all groups, support or opposition toward wild boar management was influenced by their personal interest in the species. It becomes clear that applying wildlife management strategies without considering the different attitudes held by interest groups toward wild boar, has lead to mainly conflict feelings toward the species in the RNR Nazzano-Tevere-Farfa. Determining which management options are most widely accepted by park users is key, and will help avoid the creation of wildlife

conservation programs that further increase conflict, rather than enhance public tolerance toward wild species.

Throughout the discussions held during the explorative encounters with hunters and commercial farmers, controversies became evident. Participants openly disagreed with the current management strategies applied by park authorities in the reserve. Highly debated topics in these meetings were how people can access, and benefit from, preventive methods and compensation procedures. Concerns about the damage assessments process, and the compensation timeline, were frequently mentioned. By stating, "the cages used to capture wild boar in the reserve are against animal rights laws" (personal comment from a hunter), a participant expressed his frustration about the current culling techniques inside the reserve. Dissatisfaction about this practice was due to a lack of information about both capture methodologies and the number of animals being culled. Mistrust toward the park and the real lack of transparency in how wild boar is managed in the reserve were the main reasons participants expressed conflict feelings toward the species and its management.

Recommendations for management policies

In December 2010, the plan that currently regulates wild boar management in the RNR "Nazzano-Tevere-Farfa" expired; park authorities are designing a new one for 2011-2015. Based on the knowledge acquired through this study, park authorities should continue applying preventive methods and compensation. However, these management strategies should be implemented in the area by providing technical support, such as

guidelines, that better inform people about how the process works, who is eligible, how to get compensation, and how damage assessments are carried out. In addition, a quicker process to obtain repayment should be developed by the reserve to avoid a loss of trust between affected residents and the park authorities. If the park decides to proceed with more controversial strategies, such as capture and release or culling of wild boar, specific educational campaigns about the ecological impacts of wild boar, agricultural damages, and vehicle collisions should be designed and administered to the general public. This approach will reduce cognitive conflicts in the area, as false beliefs about how many wild boars are killed in the area or what happens to the animals once captured and released will be addressed. In addition, the rationale for applying any controversial techniques can be explained. To obtain support toward wild boar population control from hunters, park authorities should engage this group directly in the management of the species. As highlighted by the qualitative data collected during the meetings, hunters can represent a source of help and insight for the park, as this group is willing to aid managers in providing preventive methods to farmers, assisting in wild boar monitoring, and carrying out the cull inside the protected area. Sharing information about how many animals are officially removed from the area per wild boar control session is necessary to start a dialogue with local interest groups and to set the foundation for future collaborative work between the reserve and local communities.

To date, no further public involvement has been planned or carried out in the reserve. However, more meetings with interest groups are needed in the future to include opinions from local communities about wild boar management strategy preferences.

Furthermore, local actors should be invited to evaluate and provide insights to the management plan of 2011-2015. Only with the support of local communities and interest groups on how to manage this controversial species in the reserve will managers decrease conflict and consequently manage wild boar more efficiently. This approach will not only clarify the tasks of the park and the responsibilities of local communities toward wildlife, it will also address problems raised by the lack of institutional stability in Italy, as it will foster long-term partnerships between residents and park authorities. Wildlife management will be based on shared information, participation, trust, and positive attitudes.

Conclusions

There are marked tensions between park authorities and interest groups in the reserve. It is most likely that the conflicts are a result of the limited public involvement in wild boar management planning of the reserve. Surveys and meetings rarely explore issues in depth and from a variety of perspectives, and are not enough to fully understand social dynamics and community needs (Bath 1998; Jacobson and Duff 1998; Bath and Majic 2001; Madden 2004a; Manfredo et al. 2009). Often, providing overviews of wildlife and its management are considered ways to involve local communities in wildlife decision-making processes in Italy (Glikman and Frank 2011). However, this partial local community engagement does not enable park managers to really understand which wildlife management strategies are widely accepted by local residents and thus ideal for mitigating conflicts and enhancing coexistence on the ground.

Many of the wild boar issues detected for the RNR Nazzano-Tevere-Farfa, such as damages to agricultural crops, wild boar-vehicle collisions, conflicts with hunters over species management, and lack of public involvement, are shared with other parks within Lazio region, Italy, and, other geographical locations worldwide (Massei and Genov, 2004; Monaco et al. 2010; Massei et al. 2011; Rossell et al 2011). The wild boar management implications suggested for this reserve can be beneficially applied to other contexts and protected areas. A better integration of wild-boar management with facilitated human dimension approaches in order to design shared wildlife management plans can represent an innovative way to look at human-wild boar challenges in and around protected areas. The concept of focusing on areas of disagreement and commonality between park users is applicable for other species and geographical locations, making this approach transferable to broader contexts. Through this approach, park authorities will be able to understand and identify the underlying conflicts and controversies of wildlife management, and thus recognize and apply management options that foster coexistence and are supported and accepted by a larger section of society.

At a time when human settlements are expanding more and more into natural areas, and interactions between human and wildlife are becoming increasingly common (Woodroffe, 2000; Jankins and Keal, 2004; Woodroffe et al., 2005), park managers need to go beyond biological research and move toward strategies that better encompass local communities in wildlife management (Bath, 1996; Jacobson and Duff 1998; Manfredo et al. 2009). Indeed, conservation strategies today may succeed or fail, not because of poorly developed biological science, but due to the lack of understanding and integration

of people's values toward wild species in wildlife management (Jacobson and Duff 1998; Mascia et al. 2003). If a wildlife manager's goal is to work toward a more wildlife-tolerant society, projects that embody species conservation and local community engagement are desperately needed. Effective wildlife management is not only managing species, but also listening to people and working with them to establish shared and supported wildlife management and conservation projects.

References

Apollonio M, Randi E, Toso S. (1988) The systematics of the wild boar (*Sus scrofa L.*) in Italy. Italian J Zool 3: 213-221.

Apollonio M, Mattioli L, Scandura M, Mauri L, Gazzola A, Avanzinelli E (2004) Wolves in the Casentinesi Forests: insights for wolf conservation in Italy from a protected area with a rich wild prey community. Biol Conserv 120(2): 249-26.

ARP (2010). Database on wildlife management in protected areas of Lazio region. Unpublished raw data of the Regional Park Agency Lazio.

Bath AJ (1998) The role of Human Dimension in wildlife resource research in wildlife management. Ursus 10:349-355.

Bath AJ, Majic A (2001) Human Dimensions in Wolf Management in Croatia: Understanding Attitudes and Beliefs of Residents in Gorski Kotar, Lika and Dalmatia toward Wolves and Wolf Management. LCIE - Large Carnivore Initiative for Europe.

Bronner SJ (2008) Killing tradition: inside hunting and animal rights controversies. University of Kentucky Press, Lexington

Carnevali L, Pedrotti L, Riga F, Toso S (2009) Ungulates in Italy: Status, distribution, abundance, management and hunting of Ungulate populations in Italy - Report 2001–2005. Biol Cons Fauna, 117 Istituto Nazionale Fauna Selvatica.

Carnevali L., Scacco M. (2009) Indagine sull'atteggiamento della popolazione residente e non nei confronti del Cinghiale (*Sus scrofa*) nel Parco Regionale dei Colli Euganei Relazione tecnica n. 3.3. Istituto Nazionale Fauna Selvatica.

Creswell JW (1998) Qualitative inquiry and research design: Choosing among five traditions. Thousand Oaks, CA: Sage.

Dandy N, Ballantyne S, Moseley D, Gill R Quine C (2011) Preferences for wildlife management methods among the peri-urban public in Scotland. Eur J Wildl Res April:1-9.

D'Antoni, S., & Lugari, A. (2005). Guida ai servizi delle aree naturali protette del Lazio. Riserva Natirale Nazzano-Tevere-Farfa. Beta Tipografica s.r.l., Italy.

Decker, D.J., Brown T.L. & Siemer, W.F. (2001). Human Dimensions of Wildlife Management in North America. The Wildlife Society. Bethesda; Maryland.

Frank B., Bath A.J. (2009) Human Dimensions in Wild boar management in Lazio Region: Toward understanding conflict and coexistence. Technical Report 2008-2009. Regional Park Agency Lazio.

Frank B., Bath A.J. (2010) Human Dimensions in Wild boar management in Lazio Region: Toward understanding conflict and coexistence. Technical Report 2009-2010. Regional Park Agency Lazio.

Frassanito A. G. (2005) Verso la gestione partecipativa della problematica cinghiale nel Parco Nazionale del Gargano. Master thesis. Facoltà di Scienze Matematiche

Fisiche e Naturali Dipartimento di Biologia Animale e dell'Uomo, Univesità degli Studi di Roma La Sapienza.

Glikman J A, & Frank B (2011) Human dimensions of wildlife in Europe: the Italian way. Hum Dim Wildl (accepted for publication 16 (5): 368-377.

Green D, Askins GR, West PD (1997) Public opinion: obstacle or aid to sound deer management. Wildl Soc Bull 25:367–370

Hall D, Hall I. (1996) Practical Social Research: project work in the community. Macmillan Press LTD, Malaysia

ISTAT, 2004. Rapporto annuale 2004. Webinfo www.istat.it. Accessed 1 march 2009.

Jacobson SK, Duff MD (1998) Training Idiot Savants: The Lack of Human Dimensions in Conservation Biology. Conserv Bio 12(2): 263-267.

Jenkins, J., Keal, A. (2004). The Aditondack atlas. Syracuse: Syracuse University Press.

Linkie M, Dinata Y, Nofrianto A, Leader-Williams N (2007) Patterns and perceptions of wildlife crop raiding in and around Kerinci Seblat National Park, Sumatra. Anim Conserv 10 (1): 127-135.

Manfredo, M.J., Vaske, J.J., Brown, P.J., Decker, D.J. & Dike, E.A. (2009). Wildlife and society: the science of human dimensions. Island Press, Washington, DC.

Manfredo M J, Vaske JJ, Teel TL (2003) The potential for conflict index: a graphic approach to practical significance of human dimensions research. Hum Dim Wildl 8:219–228.

Madden F. (2004a) Creating coexistence between humans and wildlife: global perspectives on local efforts to address human-wildlife conflict. Hum Dim Wildl 9: 247-257.

Madden, F (2004b) Can traditions of tolerance help minimize conflict? An exploration of cultural factors supporting human-wildlife coexistence. Policy Matter 13: 234-241.

Mascia BM, Brosius JP, Dobson TA, Forbes BC, Horowitz L, Mc Kean MA, Turner, NJ (2003). Conservation and the Social Sciences. Conser Bio 17: 649-650.

Massei G, Sugoto R, Bunting R (2011) Too many hogs? A review of methods to mitigate impact by wild boar and feral hogs. Hum–Wildl Interac 5(1):79–99.

Massei G, Genov P V (2004) The environmental impact of wild boar. Galemys: 16: 135-145.

Meriggi A, Lovari S (1996) A review of wolf predation in southern Europe: does the wolf prefer wild prey to livestock? Jour Appl Ecol 33: 1561-1571.

Messmer, TA (2000) The emergence of human-wildlife conflict management: turning challenges into opportunities. Intern Biodet and Biodegr 45: 97-102.

Messmer, TA (2009) Huma-wildlife conflicts: emerging challenges and opportunities. Hum-Wildl Conf 3: 10-17.

Monaco A, Franzetti B, Pedrotti L, Toso S (2003) Linee guida per la gestione del cinghiale. Ministero Politiche Agricole e Forestali-I.N.F.S.

Monaco A, Carnevali L, Toso S (2010) Linee guida per la gestione del Cinghiale (*Sus scrofa*) nelle aree protette. 2° edizione. Quad. Cons. Natura, 34, Min.Ambiente – ISPRA.

Panchetti F (2003) Studio per la realizzazione di un questionario come strumento per una ricerca di human dimension of wildlife management sui conflitti generati dal cinghiale (*Sus scrofa*) in contesti rurali. Master thesis. Facoltà di Scienze Matematiche Fisiche e Naturali Dipartimento di Biologia Animale e dell'Uomo, Univesità degli Studi di Roma La Sapienza.

Pontuale S (2009) Human Dimension nella gestione del cinghiale nella Riserva Naturale Regionale del lago di Vico. Master thesis. Facoltà di Scienze Matematiche Fisiche e Naturali Dipartimento di Biologia Animale e dell'Uomo, Univesità degli Studi di Roma La Sapienza.

Rosell C, Navàs F, Romero S, de Dalmases I, Sforzi A, Tonini L (2011) Wild Boar in Mediterranean protected areas: managing the conflicts. XXXth IUGB Congress (International Union of Game Biologists) and Perdix XIII. Serviweb http://www.iugb2011.com/index.php?option=com_content&view=article&id=75. Accessed 13 Sptember 2011.

Rulli M, Savini S (2008) Studio di Human Dimension sulla presenza del cinghiale nel Parco Regionale di Veio. Istituto di Ecologia Applicata. Technical Report 2007. Regional Park Agency Lazio.

Sáez-Royuela C, Telleriá JL (1986) The increased population of wild boar (*Sus scrofa L.*). Europe Mammal Rev 16:97–101

Sheskin, I. M., (1985). Survey research for geographers. Association of American Geographers, Washington, D.C., USA.

Schley L., Roper, T. J. (2003). Diet of wild boar *Sus scrofa* in Western Europe, with particular reference to consumption of agricultural crops. Mammal Rev 33: 43–56.

Scillitani L, Monaco A, Toso S (2010) Do intensive drive hunts affect wild boar (*Sus scrofa*) spatial behaviour in Italy? Some evidences and management implications. Eur J Wildl Res 56:307–318.

Siemer WF, Lauber TB, Chase LC, Decker DJ, McPeake RJ, Jacobson CA (2004) Deer/elkmanagement actions in suburban environments: what will stakeholders accept? In: Shaw WW, Harris LK, VanDruff L (eds) Proceedings of the 4th International Symposium on Urban Wildlife Conservation. May 1–5, 1999, Tucson, Arizona. Available at http://cals.arizona.edu/pubs/adjunct/snr0704/snr07042t.pdf

Treves A, Wallace RB, Naughton-Treves L, Morales A (2006) Co-managing human-wildlife conflicts: a review. Hum Dim Wildl 11: 383-396.

Toïgo C, Servanty S, Gaillard JM, Brandt S, Baubet E (2008) Disentangling natural from hunting mortality in an intensively hunted wild boar population. J Wildl Manage 72(7):1532–1539.

Toso S, Pedrotti L (2001) Linee guida per la gestione del cinghiale (*Sus scrofa*) nelle aree protette. Quad. Cons. Natura, 2, Min. Ambiente - Ist. Naz. Fauna Selvatica.

Tsachalidis E, Hadjisterkotis E (2008) Wild boar hunting and socioeconomic trends in Northern Greece, 1993–2002. Eur J Wildl Res 54:643–649.

Vaske JJ (2008) Survey research and analysis. Application in parks, recreation and Human Dimensions. Venture Publishing, Inc., State Collage, Pennsylvania.

Vaske J J, Needham M D, Newman P, Manfredo M J, Petchenik J (2006) Potential for conflict index: Hunters' responses to chronic wasting disease. Wildl Soc Bull 34: 44-50.

Warner RM (2008) Applied Statistics: from bivariate through multivariate techniques. SAGE Publications, Inc. U.S.A.

Woodroffe, R. (2000). Predators and people: using human densities to interpret declines of large carnivores. Anim Conserv 3: 165-173.

Woodroffe, R., Thirgood S. and Rabinowitz, A. (2005). People and Wildlife. Conflict or coexistence. Cambridge University Press, Cambridge, UK.

10. Discussion and Conclusions

Human-wildlife interactions are commonly defined and addressed by researchers as conflicts between people and wild species (Messmer, 2000; Manfredo and Dayer, 2004; Distefano, 2005; Treves et al., 2006; Messmer, 2009; Peterson et al., 2010), rather than considered as interactions that may be positive or negative for people or for wildlife (Bath and Enck, 2003; Madden, 2004 a,b; Peterson et al., 2010). To work toward solutions that maximize wildlife management and conservation success, there is a need to consider and include neutral to positive human-wildlife interactions in wildlife management and conservation (Riley et al., 2002; Mangun et al., 2009; Peterson et al., 2010). Indeed, if neutral to positive perceptions toward species are carefully integrated, coexistence between humans and wildlife can be better fostered (Madden, 2004b).

The overarching goal of this dissertation was to explore if conflict and coexistence could be designed and applied as concepts along a continuum. The negative spectrum of the continuum ranges from a major conflict to a small nuisance; in the middle, the neutral area, neither positive nor negative feelings are associated with wildlife; the positive end of the continuum ranges from a tolerated annoyance to the integration and acceptance of wildlife within the human landscape. Considering conflict and coexistence as a continuous concept was a new way to look at human-wildlife interactions. It also represented the first step toward implementing a framework that used negative to positive feelings toward species in wildlife management and conservation. Specifically, a framework was developed in this dissertation to 1) better understand human-wildlife

interactions along the conflict-coexistence continuum 2) identify and prioritize actions that encompass conflict and coexistence in wildlife management and conservation and 3) involve the public in management and conservation decision-making processes to better address conflicts and increase coexistence. The specific objectives of this study focused on examining how the conflict-coexistence continuum concept and framework were shaped by 1) the scale format used to explore these concepts; 2) the location in which a participant lives; and 3) the interest participants hold toward wildlife. To investigate these objectives and implement the proposed framework, a case study using wild boar and its management was completed in two protected areas of central Italy: Circeo National Park and the RNR Nazzano-Tevere-Farfa. Furthermore, the three objectives of this dissertation were explored in a theoretical, a methodological, and an empirical paper. The outcomes of these papers are reported in the following paragraphs.

In the first paper of this dissertation, two case studies tested different measurement scales to understand how to obtain the most accurate data about public feelings along the conflict-coexistence continuum. In the first case study, a five-point Likert-type scale was compared to a classic VAS in Circeo National Park. In the second one, the five-point Likert-type scale was compared to a segmented VAS in the RNR Nazzano-Tevere-Farfa. In both case studies, the scales generated different outcomes when measuring public feelings toward wild boar. Consistent with many studies (Guyatt et al., 1987; Ahearn, 1997; Svensson, 2000; Cook et al., 2001; Christ and Boice, 2009), the VAS format did have higher discriminatory power and variance, and it was able to detect smaller changes across responses than the Likert-type scale. By not restricting participants with

predetermined categories and scale labelling, more details of the intensity of a perception, and a finer evaluation of participants' feelings toward a specific topic, have been obtained (Lange and Söderlund, 2004; Christ and Boice, 2009). Thus, the VAS can be used to investigate negative, neutral, and positive human-wildlife interactions as its linear format enables a more precise evaluation of the degree of public willingness to tolerate or not a certain species or specific interaction with wildlife. As the conflict-coexistence continuum line can remain the same across countries, languages, and cultures, the VAS represents a working tool to explore human-wildlife interactions and the conflict-coexistence profile of the framework. By further investigating response wording and design, researchers will be able to develop items that better represent human thought and action toward specific research topics, and thus design public involvement and conflict resolution techniques that enhance tolerance rather than exacerbate conflict.

From a theoretical perspective, this dissertation investigated the conflict-coexistence continuum concept. Human-wildlife interactions were explored by focusing on conflict to coexistence perceptions toward wild boar and its management held by people living both inside and outside the boundaries of a protected area. The aim was to understand if, and how, negative to positive perceptions were shaped and influenced by the location in which human-wildlife interactions occurred. No matter the location of residence, both groups expressed tolerance toward wild boar. Participants stated a high degree of willingness to coexist with wild boar, as demonstrated by the scores obtained by measuring participants' answers along the conflict-coexistence continuum. The proximity of the species to where people lived did not result in a "not in my back yard"

(NIMBY) effect (Riley and Decker, 2000; De Stefano and Deblinger, 2005). If the NIMBY effect was present, we would predict less positive attitudes and more support for management of the species from those living closest to wild boar. However, people living inside Circeo National Park tended to hold stronger positive attitudes and more protectionist values toward wild boar than those living outside the protected area, who were more concerned about how the species should be managed. This switch in priorities highlights differences in public perception toward wild boar across the Circeo National Park boundary. Similar to recent studies (Huber et al., 2010; de las Heras et al., 2011), it is demonstrated in this dissertation that different legal and management frameworks across protected area boundaries influence participants' perceptions toward wildlife and wildlife management (Landres et al., 1998; Johansson, 2008). Unawareness or partial understanding of differences in attitudes held by people living in different locations can lead managers to apply wildlife strategies that foster conflict rather than coexistence, and thus shift public acceptance toward rejection of a species. To maintain and enhance public positive attitudes towards wildlife, and to foster a willingness to tolerate wildlife in their proximity, there is a need to build a conflict-coexistence profile sensitive to location. This will better encompass all types of human-wildlife interactions in wildlife management and conservation (Madden, 2004 a,b; Mangun et al., 2009; Peterson et al., 2010). Only in this way will managers be able to promote positive attitudes toward wildlife, and enhance public willingness to coexist with wild species.

In the third paper, the conflict-coexistence continuum framework was applied on the ground by starting a dialogue with interest groups about wild boar management

practices in the RNR of Nazzano-Tevere-Farfa. Understanding the views held by participants regarding perceptions toward wildlife and its management can help park authorities recognize which conflicts are present in an area, identify which management options are most widely supported by local communities, and promote management strategies that foster coexistence rather than conflict (Green et al., 1997; Siemer et al., 2004; Bronner, 2008; Dandy et al., 2011). Thus, perceptions of conflict and coexistence and attitudes toward compensation, preventive measures, and wild boar population control were investigated by gathering input from the general public, hunters, commercial farmers, and subsistence farmers in the RNR Nazzano-Tevere-Farfa. Interest groups differed in their conflict to coexistence perceptions toward wild boar, as well as in their opinions about which management strategies should be applied inside the reserve. All participants were in favour of preventive measures and compensation systems to reduce wild boar damages. Not all groups supported the capture and release and culling the species inside the reserve, however. To design wildlife conservation programs that foster coexistence rather than conflict , park managers should better encompass the opinions of local communities in decision-making processes by applying wild boar management strategies that are widely supported (e.g., preventive methods, compensation) (Bath, 1996; Jacobson and Duff, 1998; Manfredo et al., 2009). Selecting and applying strategies without considering the different attitudes held by interest groups toward wildlife management can lead to an increase of local community hostility and mistrust toward park authorities and protected areas (Madden, 2004a). Effective wildlife management is, therefore, not only about managing species, but also listening to people and working with them to establish shared and supported wildlife management and conservation projects.

With increasing human populations and recovering wildlife species, human-wildlife interactions are inevitable (Wodroffe et al., 2005). If the right conditions are created by researchers and managers by sharing responsibilities and ownership of management and conservation projects with local communities, such encounters can become coexistence experiences rather than conflict situations (Wodroffe et al., 2005). Researchers and managers should not only focus on addressing negative interactions between humans and wildlife; they should also be creative and innovative in using coexistence experiences as a means to increase public willingness to tolerate wildlife in their proximity. To implement the use of conflict to coexistence perceptions in wildlife management and conservation, the theoretical, methodological, and empirical contributions of this dissertation are reported in this final section. Limitations and recommendations to further develop the newly defined conflict-coexistence continuum and framework are also described. To develop a path that encompasses more consistently all types of interactions between people and wildlife, future research directions are suggested.

10.1 Methodological contribution: the use of continuous rating scale

As a contribution to methodologies, this dissertation explored the use of VAS as a new rating format to investigate public perceptions toward wildlife. Extending the range of possible values through the use of a continuous scale enabled the collection of more information with greater precision at the item level (Christ and Boice, 2009). It also contributed to overcoming the limitations of discrete scales such as the unpredictability of the actual amount of error produced by the interaction between the number of response options and the distribution of true values (Vaske, 2008). By applying Likert-type scales

with limited response options, the measurement error produced can widen confidence intervals, thus reducing statistical power and the ability to detect small effect sizes. This is not the case when using the continuous rating scale. By extending the range of possible response options, the amount of error in measurements decreases. Using continuous rating scales allows data to be obtained with narrower confidence intervals and stronger statistical power. Such outcomes may enable researchers to identify small effects, hardly detectable with discrete rating scales. Furthermore, data obtained with continuous rating scales can be re-coded in equidistant categories consisting of equal intervals without affecting the scale properties. Such transformation enables the analysis of data obtained originally through continuous rating scales with statistical methods that require data on the level of an interval scale.

As demonstrated in this dissertation, continuous rating scales finely measure attitudes, perceptions, and behaviours toward an issue. As found in other studies (Lange and Söderlund, 2004; Christ and Boice, 2009), a more detailed description of the intensity of a perception can be detected with this scale, as participants are not restricted to answering an item with predetermined categories and scale labeling. Furthermore, a visual format can enable researchers to overcome linguistic and cultural challenges, such as different understandings of question wording, illiteracy, or the use of numerical symbols. The VAS represents a useful tool for investigating human-wildlife interactions. Through its linear format, negative, neutral, and positive perceptions toward wildlife were designed and explored as continuous and interrelated concepts. This scale allowed the investigation of negative to positive perceptions toward wildlife along a continuum

that ranges from a major conflict, to a small nuisance, to a slightly tolerated annoyance, to integration and coexistence of wildlife within the human landscape. The knowledge acquired by investigating the conflict-coexistence continuum idea with the VAS has allowed a new way to define human-wildlife interactions and the design of a new conflict-coexistence continuum framework.

Limitations

In a southern European context, building trust through personal contact was recognized as a fundamental precondition when dealing with controversial themes such as wildlife management (Bath and Majič, 2001). To overcome doubts participants may have about the trustworthiness of the research, and to obtain high response rates (Sheskin, 1985; ERIC/AE Staff, 1997), face-to-face interviews were used to carry out this research. Even though the interviewer-administered technique permits the introduction of complex questions and allows for clarification of specific items, the VAS was difficult to understand for participants. Similar results were found by other researchers (Ahearen, 1997; Lange and Söderlund, 2004), where respondents had trouble using the line response format to finely discriminate their opinion about a specific topic. The lack of prior exposure or training of participants toward this type of rating scale may have influenced their ability to express their opinion on a continuous rating scale (Ahearn, 1997; Lange and Söderlund, 2004). Furthermore, many statistical techniques have been applied in previous research to compare VAS and Likert-type scales (Aitken, 1969; Cline et al., 1992; Ahearn, 1997; Svensson, 2000; Couper et al., 2004). Such comparisons have mostly focused on whether these two scales generate similar or different data. The lack of

agreement between researchers on which statistical method is the best to obtain comparable data and the lack of literature about what is gained by using a VAS scale rather than a Likert-type scale limits our understanding of the best way to evaluate scale performances and applications (Hasson and Bengt, 2005).

Recommendations

Some of the limitations of the VAS detected in this dissertation can be easily addressed by changing data collection methods. For example, to increase a respondent's ability to express his or her opinion on a VAS format, a self-administered survey technique could be applied instead of face-to-face questionnaires. Self-administered surveys, particularly the mail questionnaire, offer greater context effects since the entire survey can be viewed and considered (Schaefer and Dillman, 1998). Mail and web survey modes let respondents complete the instrument when they want to, and at their own pace (Fricker et al, 2005; Loomis and King, 1994). The advantages of self-administered surveys may enable respondents to better understand and answer the VAS line items. In addition, these methods can be used to overcome issues related to interviewer bias and limitations of measuring tools. For example, measurement error introduced by the way the interviewer reads the measurement on the ruler or by the thickness of the pencil or object used to make a sign along the VAS line can be overcome by applying graphical user interfaces. Slider bars might represent a solution to such problems (Cook et al., 2001; Couper et al., 2006). Indeed, by using direct manipulation devices researcher-introduced biases can be eliminated and finer data measuring can be obtained. This graphical advantage of computer-assisted self-interviewing and web-based survey applications can

enable researchers to better apply the VAS scale while exploring a specific issue (Cook et al., 2001; Couper et al., 2006). Major problems encountered in this dissertation included: the lack of agreement over what type of data are generated by the VAS scale (i.e., nominal or ordinal scores versus interval or ratio scores); which statistical methods generate comparable data between Likert-type scale and VAS; and what is gained by extending the range of possible values in terms of the conceptual empowerment of the finer designated scales. The theoretical background of the scales needs to be further investigated, best statistical practice must be established, and the advantages of using continuous scales rather than itemized scales must be explored. The main recommendation is therefore to do more research on the theoretical and applied background of these rating scales "to establish weaknesses and strengths of each scale type in different contexts and in relation to different exposures of interest" (Hasson and Bengt, 2005 p.7). Since Hasson and Bengt (2005) mentioned this, little has been done on this front.

10.2 Theoretical contribution: the conflict-coexistence continuum

From a theoretical point of view, this dissertation has contributed to the understanding of the human-wildlife interaction concept by encompassing intentional or unintentional and negative to positive relationships between humans and wildlife. Coexistence has been defined as people peacefully sharing the environment with animals, and perceiving wild species as a source of their personal, cultural, economic, social, or political well being (Madden, 2004b). In this dissertation it was demonstrated that human-wildlife interactions can generate perceptions of conflict and a dislike of animals

(e.g., poison baits, illegal killing of species); they may also generate perceptions of coexistence and an enjoyment of wildlife (e.g., bird-watching, ecotourism). By investigating differences between participants living inside and outside the protected area boundary in the second paper, it became clear that conflict and coexistence can be pictured as a continuous concept sensitive to the location in which human-wildlife interactions occur. To work toward maintaining and enhancing participants' positive attitudes and willingness to tolerate wildlife in their proximity, a paradigm shift in the concept of human-wildlife interactions in the HD field must occur. The author proposes to move beyond looking only at conflict interactions, and to start more consistently considering neutral to positive human-wildlife contacts in wildlife management and conservation. This idea aligns with previous studies carried out on this topic (Mangun et al., 2009; Peterson et al., 2010).

Limitations

To include positive interactions between humans and animals in HD research, human-wildlife conflicts have been redefined as human-wildlife coexistence or interactions (Madden, 2004a, b; Peterson et al., 2010). HD studies have focused on increasing coexistence (Madden, 2004a) and on using tolerance as a tool to reframe biodiversity challenges (Madden, 2004b; Jentoft et al., 2010; Peterson et al., 2010). Consequently, the emphasis of the literature has been on shifting from conflict to coexistence, rather than on exploring conflict and coexistence at the same time in relation to the same theme of the study. The lack of literature that integrates negative to positive perceptions while exploring human-wildlife interactions has represented a limitation to

further developing the conflict-coexistence continuum concept. Another constraint in developing the conflict-coexistence continuum concept has been represented by exploring only the location in which human-wildlife interaction occurred. The focus on the influence of one geographical area (i.e. Circeo National Park) on perceptions toward wildlife has provided a partial understanding of the factors that may determine when a human-wildlife interaction turns into conflict or coexistence. Not exploring the role played by different geographical locations and other factors, such as culture and values, has represented a major constraint in fully building the conflict-coexistence continuum concept.

Recommendations

To help conservation authorities' better address conflict and increase coexistence between people and wildlife, the HD discipline should acknowledge that human-wildlife interactions are composed of negative, neutral, and positive perceptions toward wildlife. Overcoming this gap will be the first step in encompassing the complete range of human-wildlife interactions and creating a better definition of the conflict-coexistence continuum concept. Since the same human-wildlife interaction may be perceived differently in different places and times – depending upon the type of conservation law enforcement, relevant economic benefits, and many other aspects of societies living with wildlife – values and culture should be further explored. The first recommendation of this dissertation is to replicate and further develop this study in other places and for other species to better understand how the interface between a series of factors influences negative to positive perceptions toward wildlife. By encompassing different types of

human-wildlife interactions and by creating an interface between society, culture, protected areas, wildlife, and conservation, the concept of conflict and coexistence along a continuum will be strengthened to the point of becoming a working tool for successful wildlife management and conservation. A further development of the continuum might help researchers better understand the dynamics behind conflict and coexistence perceptions and thus better address human-wildlife interactions.

10.3 Empirical contribution: wild boar management guidelines

From an empirical perspective, this dissertation was part of a collaborative wild boar management project between the ARP Lazio and Memorial University. The baseline data on wild boar collected in Circeo National Park and in the RNR of Nazzano-Tevere-Farfa can be beneficially used to apply management strategies that are widely supported by local communities, to plan more effective public involvement, and to design communication campaigns that better address wild boar challenges in these two protected areas. While the key findings on wild boar and its management were focused on these two specific parks, the knowledge acquired about public perceptions toward the species can be used to implement the current wild boar management guidelines of Italy (Monaco et al., 2010).

In these guidelines, themes such as the status of wild boar in Italy, the impact of wild boar on natural ecosystems, wild boar population monitoring, control and management, and the social dimension of wild boar challenges are discussed (Monaco et al., 2010). Methods of collecting data on biometrical measurements of wild boar, culling,

and other management strategies, among other topics, are also provided (Monaco et al., 2010). Although these guidelines do document the social dimension of wild boar challenges, this policy document mostly focuses on the biological features of wild boar management. As demonstrated in this dissertation, there is a need to better integrate biophysical and social science research for successful wildlife management and conservation. This will help understand and identify the underlying controversies of a species and to recognize and apply management options that foster coexistence rather than conflicts in and around protected areas (Riley et al., 2002). Since none of the research carried out in this study is currently integrated in the wild boar guidelines of Italy, the HD findings of this dissertation can be used to redesign the social dimensions section of the current guidelines. For example, a general questionnaire based on the data collection tools used in this dissertation could be designed for the guidelines and provided as appendix in the document. Tips on how to identify and select participants, as well as how to involve them in HD studies, could be based on the methods used to carry out this research. Furthermore, as managers and researchers communicate and interact with communities through education campaigns (Sillero-Zubiri and Laurenson, 2001), directions on how to design effective communication messages about wild boar could be provided in the guidelines by integrating the results obtained in this study. The many lessons learned while designing, planning, and carrying out this dissertation could be beneficially applied to further develop the social science component of the wild boar guidelines document. A better integration of biological and human factors in these guidelines will not only allow easier implementation of wild boar management in Italy, it will also create a document that can be used as a reference for wild boar management in

other countries. Indeed, many of the issues explored in this dissertation, such as wild boar impacts on human activities, conflicts with interest groups over species management, and the lack of public involvement, are common to other protected areas (Massei and Genov, 2004; Monaco et al. 2010; Massei et al. 2011; Rossell et al 2011). Specifically, the Italian guidelines for wild boar management in and around protected areas will represent a template that can be replicated and adapted to other protected areas worldwide.

Limitations

Collecting baseline data on public attitudes toward wildlife and its management is often considered enough to understand people's perceptions toward wildlife issues in Italy (Glikman and Frank 2011). However, such data does not always enable park managers to fully understand wildlife management and conservation challenges as social dynamics and community needs are rarely explored in depth and almost never from a variety of perspectives (Bath 1998; Jacobson and Duff 1998; Bath and Majic 2001; Madden 2004a; Manfredo et al. 2009). To better understand the complex situation facing wild boar and its management in Lazio region, a complete public involvement process with local residents about the species was initially planned for the RNR Nazzano-Tevere-Farfa. After collecting baseline data, communicating results to participants, and starting to engage residents in the decision-making process, the public involvement process stalled. Unfortunately, the local socio-political background and the low manager willingness to support and implement public participation in wild boar management in the study area have lead to an interruption of the process (Glikman and Frank, 2011). This limited engagement in wild boar management might be due to a lack of interest from

managers, politicians, and other interest groups in dealing with human-wild boar issues in the study area. The partial local community involvement carried out in the protected area has limited the implementation of the human dimension approach in wild boar management. The knowledge acquired in this dissertation alone cannot fully implement the social science section of the Italian wild boar management guidelines.

Recommendations

To address social science in the guidelines, further public participation with local communities should be carried out to better include public opinions in wild boar management. Through a participatory approach, researchers could bring results back to participants and validate the information obtained in this research. Feedback and insight from the public could also be obtained through their involvement in wildlife decision-making processes (Bath, 1998; Madden 2004a; Manfredo et al. 2009). By better integrating biophysical and social science, researchers and managers will be able to design guidelines that address human-wild boar interactions in a detailed way and manage the species more efficiently. An exhaustive public involvement approach will not only benefit the drafting of the wild boar management guidelines, it will also allow managers to overcome group differences, increase participant ownership of the outcome, and foster commitment toward wildlife management and conservation projects (Messmer, 2000; Cvetkovich and Winter, 2003; Wilson, 2008). Through more facilitated meetings, managers and researchers will be able to clarify the tasks of the park and the responsibilities of local communities toward wildlife and the protected area. Problems raised by the lack of institutional stability in Italy can be addressed in these meetings. By

solving these types of problems, long-term partnerships between residents and park authorities will be created and fostered. Efficient wild boar management will be achieved through shared information, participation, trust, and positive attitudes between local communities and park authorities.

10.4 The conflict-coexistence framework

As human-wildlife issues are often complex and multidimensional, an HD approach was applied to develop the theoretical contribution of this dissertation. To achieve a vision where biophysical and social sciences are encompassed in wildlife management and conservation (Riley, 2002; Enck et al., 2006), animal geography, anthropology, conservation biology, and resource management insights were included in the introduction to develop the conflict-coexistence continuum concept. This approach has helped better characterize human-wildlife interactions and coexistence. It has also allowed the consideration of conflict and coexistence, not as distinct concepts, but as related events that can be addressed together to achieve successful wildlife management and conservation. Through the development of the conflict-coexistence continuum concept, this dissertation contributes to the field of HD. This research fills the gap left by previous studies, which tend to explore either negative or positive perceptions – not both – toward species while addressing human-wildlife interactions. It also goes a step further by proposing a framework that provides a structured approach to select action that minimizes conflict and maximizes coexistence between people and wildlife. This framework was designed to help better understand human-wildlife interactions along the conflict-coexistence continuum, to identify and prioritize actions that encompass

coexistence in wildlife management and conservation, and to involve the public in management and conservation decision-making processes. The iterative process proposed in the framework was developed to increase the success of wildlife management and conservation projects and to foster long-term partnerships between researchers, managers, and the public. Furthermore, while conflict to coexistence perceptions are related to the specific context where such actions occur, the idea of conflict and coexistence along a continuum can be beneficially applied for different species, geographical locations, and cultures. Thus, the framework should have applications in other places and for other species.

Limitations

One of the biggest limitations of the conflict-coexistence continuum framework outlined above is that "the true test of a framework is its applicability in the real world" (Barlow et al., 2010, p.1339). Being that the framework was an outcome of redefining human-wildlife interactions, describing coexistence and exploring conflict and coexistence along a continuum, not all steps described in the framework were explored in this research. For example, the human-wildlife interaction profile was not fully developed while planning the study. While the conflict-coexistence continuum idea has been applied to identify actions to address conflict and coexistence and a few facilitated workshops have been carried out in the RNR Nazzano-Tevere-Farfa to obtain feedback and insight on those actions, no real implementation, application, or monitoring has occurred. These limitations have prevented the researcher from exploring if the application of widely supported and accepted wildlife management and conservation actions shift negative to

positive perceptions toward a species along the conflict to coexistence continuum.

Recommendations

This dissertation provides an innovative framework that implements the use of negative to positive perceptions toward species in wildlife management and conservation. Given that the framework carried out in this research was different from the one discussed in the overview, there is a need to further explore this framework to assess its validity. Therefore, the last recommendation of this dissertation is to design and implement a long-term monitoring project that follows the entire process suggested in the framework. Such an approach would enable researchers to evaluate the applicability of the framework, explore changes in perception over time, and test, in the real world, how conflict to coexistence perceptions toward a species in a specific area could be influenced by the application of supported and shared management and conservation actions. While carrying out the entire framework process, the single steps could be reviewed and implemented to ensure a better fit of the model to the real world. By further developing this framework, it will be possible to refine the definitions of conflict and coexistence along a continuum and to start understanding when conflicts are minimized to the point that coexistence between people and wildlife starts to occur.

10.5 Future research

Reframing biodiversity challenges by better addressing conflict and by more consistently encompassing coexistence in wildlife management and conservation has been the main focus of this dissertation. Although public conflict to coexistence

perceptions toward wildlife are widely explored and discussed in this study, further research should be carried out on this topic. The concept of conflict and coexistence along a continuum should be deepened by exploring the factors that minimize conflicts to the point that people start to tolerate wildlife in their proximity. The influence of people's values, culture, and location of residence, among other factors, should be better understood in order to implement this newly designed concept. A deeper understanding of the factors influencing the conflict-coexistence continuum will be beneficial for further developing the framework proposed in this dissertation. Such knowledge will help in reviewing and refining the single steps of the framework. It will also enable researchers and managers to target the single steps of the framework to the specific species, culture, and location in which the study is carried out. The further development of the conflict-coexistence continuum and its framework will enable researchers and managers to better understand the reasons behind negative to positive attitudes toward wildlife, helping conservation authorities work toward solutions that focus on mechanisms of coexistence rather than on mitigating conflicts (Madden 2004b; Peterson et al. 2010).

In this dissertation, baseline data on the attitudes of the general public and interest groups toward wild boar and its management were collected. Facilitated encounters with interest groups occurred as the first step in engaging local communities in wildlife decision-making processes. Unfortunately, the participatory approach planned for this HD project stalled during research. In Italy, the lack of previous public involvement in wildlife management and conservation, along with the unwillingness of managers to engage other participants in wildlife management and conservation, has limited the

involvement of the public (Glikman and Frank, 2011). This problem is common to other countries; research on the reasons behind managers' reluctance to delegate power to the public is needed. Political limitations and instability should be also considered while exploring constraints that limit the use of HD findings in Italy and other countries around the world. By understanding the limitations behind implementing HD studies, researchers will be able to overcome the constraints and design participatory processes that can be successfully carried out. By recognizing HD research as an integral tool for successful wildlife management and conservation, researchers and managers will better address societal needs regarding wildlife and achieve long-term success of management and conservation projects.

11. References Discussion-Conclusions

Ahearn, E. P. (1997). The use of Visual Analogue Scales in mood disorders: A critical Review. *Journal of Psychiatric Research* 31: 569-579.

Aitken, R. B. C. (1969). Measurements of feelings using a visual analogue scale. *Proceedings of the Royal Society of Medicine* 62: 989-993.

Bath, A. J. (1996). Increasing the applicability of human dimensions research to large predators. *Journal of Wildlife Research* 1: 215-220.

Bath, A. J. (1998). The role of human dimensions in wildlife resource research in wildlife management. *Ursus* 10: 349-355.

Bath, A. J. and Majîc, A. (2001). *Human Dimensions in Wolf Management in Croatia: Understanding Attitudes and Beliefs of Residents in Gorski Kotar, Lika and Dalmatia toward Wolves and Wolf Management*. LCIE - Large Carnivore Initiative for Europe.

Barlow, A. C. D., Greenwood C. J., Ahmad I., U., and Smith, J.L. (2010). Use of an action-selection framework for human-carnivore conflict in the Bangladesh Sundarbans. *Conservation Biology* 24(5): 1338-1347.

Bronner, S. J. (2008). *Killing tradition: inside hunting and animal rights controversies*. Lexington, University of Kentucky Press.

Christ, T. J., and Boice, C. (2009). Rating scale items. A brief review of nomenclature, components, and formatting to inform the development of Direct Behavior Rating (DBR). *Assessment for Effective Intervention* 34: 242-250.

Cline, M. C., Herman, J., Shaw, E. R., and Morton, D. R. (1992). Standardization of the Visual Analogue Scale. *Nursing Research* 41; 378-379.

Conover, M. R. (1998). Perceptions of American agricultural producers about wildlife on their farms and ranches. *Wildlife Society Bulletin* 26: 597-604.

Conover, M. R., Pitt, W. C., Kessler, K. K. DuBow, T. J., and Sanborn, W. A. (1995). Review of human injuries, illnesses, and economic losses caused by wildlife in the United States. *Wildlife Society Bulletin* 23:407-414.

Cook, C., Heath, F., and Thompson, R. L. (2001). Score reliability in web-or internet-based surveys: Unnumbered Graphic Ratings Scales versus Likertt-type scales. *Educational and Psychological Measurement* 61: 697-706.

Corbet G. and Ovenden D., 1986. Guida dei Mammiferi d'Europa. Franco Muzzio ed. 288 pp.

Couper, M. P., Tourangeau, R., Conrad, F. G., and Singer, E. (2006). Evaluating the effectiveness of Visual Analog Scales. A web experiment. *Social Science Computer Review* 24: 227-245.

Cvetkovich, G., and Winter, P.L. (2003). Trust and social representations of the management of threatened and endangered species. *Environment and behavior* 35(2): 286-307.

Dandy N, Ballantyne S, Moseley D, and Gill R Quine C (2011) Preferences for wildlife management methods among the peri-urban public in Scotland. *European Journal of Wildlife Research*, April:1-9.

De Stefano, S., and Deblinger, R. (2005). Wildlife as valuable natural resources vs. intolerable pests: a suburban wildlife management model. *Urban Ecosystems* 8: 179–190.

De las Heras P., P.Fernández-Sañudo, N.López-Estébanez, and M. J. Roldán (2011). Territorial dynamics and boundary effects in a protected area of the Central Iberian Peninsula. *Central European Journal of Geosciences* 3 (1): 1-11.

Distefano, E. (2005) *Human-Wildlife Conflict Worldwide: A collection of case studies, analysis of management strategies and good practices*. SARD Initiative Report, FAO, Rome.

Enck, J. W., Decker, D. J., Riley, S. J., Organ, J. F., Carpenter, L. H., and Siemer, W. F. (2006). Integrating ecological and human dimensions in adaptive management of wildlife-related impacts. *Wildlife Society Bulletin* 34:698–705.

ERIC/AE Staff (1997). Designing structured interviews for educational research. Practical *Assessment, Research and Evaluation* 5(12).

Fricker, S., Galesic, M., Tourangeau, R. and Yan, T. (2005) An experimental comparison of web and telephone surveys. *Public Opinion Quarterly* 69(3): 370-392

Glikman, J. A., and Frank, B. (2011). Human dimensions of wildlife in Europe: the Italian way. *Human Dimension of Wildlife* 16 (5): 368-377.

Green, D, Askins, G. R., and West P. D. (1997) Public opinion: obstacle or aid to sound deer management. *Wildllife Society Bulletin* 25:367–370

Guyatt, G. H., Townsend, M., Berman, L. B., and Keller, J. L. (1987). A comparision of Likertt and Visual Analogue Scale for measuring change in function. *Journal of Chronic Diseases* 40: 1129-1133.

Hasson, D., and Bengt, B. A. M. D. (2005). Validation and findings comparing VAS vs. Likertt scales for psychosocial measurements. *International Electronic Journal of Health Education* 8:178-192.

Huber, P. R.., S. E. Greco, and J. H. Thorne (2010). Boundaries Make a Difference: The Effects of Spatial and Temporal Parameters on Conservation Planning. *The Professional Geographer* 62 (3): 409-425.

Jacobson SK, and Duff M. D. (1998) Training Idiot Savants: The Lack of Human Dimensions in Conservation Biology. *Conservation Biology* 12(2): 263-267.

Johansson, T. (2008). *Beasts on Fields. Human-Wildlife Conflict in Nature-Culture Borderlands. Academic dissertation*. Helsingin Yliopiston maantieteen laitoksen julkaisuja A145. Department of Geography, University of Helsinki. Hansaprint, Helsinki.

Lange, F., and Söderlund, M. (2004). *Response formats in questionnaires: Itemized rating scales versus continuous rating scales*. SSE/EFI Working Paper Series in Business Administration, No. 2004, 13.

Landres, P. B., S. Marsh, L. Merigliano, D. Ritter, and A. Norman (1998). *Boundary effects on wilderness and other areas*. Pages 117-139. In Knight, R. L., Landres, P. B., eds. Stewardship across boundaries. Covelo, CA. Island Press.

Loomis, J. and King, M. (1994) Comparison of mail and telephone-mail contingent valuation surveys. *Journal of Environmental Management* 41: 309-324

Madden, F. (2004a). Creating coexistence between humans and wildlife: global perspectives on local efforts to address human-wildlife conflict. *Human Dimensions of Wildlife* 9, 247-257.

Madden, F. (2004b). Can traditions of tolerance help minimize conflict? An exploration of cultural factors supporting human-wildlife coexistence. *Policy Matters* 13: 234-241.

Manfredo, M. and Daye, A. (2004). Concepts for Exploring the Social Aspects of Human-Wildlife Conflict in a Global Context. *Human Dimensions of Wildlife* 9: 1-20.

Manfredo, M.J., Vaske, J.J., Brown, P.J., Decker, D.J. and Dike, E.A. (2009). *Wildlife and society: the science of human dimensions*. Island Press, Washington, DC.

Mangun, M. C., C. A. Degia, and M. A. Davenport (2009). Neighbors yet stranger: local people's awareness of Cypress Creek National Wildlife Refuge, Southern Illinois, USA. *Society and Natural Resources* 22: 295-307

Mascia, B. M., Brosius, J. P., Dobson, T.A., Forbes, B. C., Horowitz, L., Mc Kean, M. A., and Turner, N. J. (2003). Conservation and the Social Sciences. *Conservation Biology* 17: 649-650.

Massei G., and Genov P. V. (2004) The environmental impact of wild boar. *Galemys* 16: 135-145.

Massei G., Sugoto R., and Bunting R. (2011) Too many hogs? A review of methods to mitigate impact by wild boar and feral hogs. *Human Wildlife Interaction* 5(1):79–99.

McLain, R.J. and Lee, R.G. (1996). Adaptive management: promises and pitfalls. *Environmental Management* 20(4): 437-448.

Messmer, T. A. (2000). The emergence of human-wildlife conflict management: turning challenges into opportunities. *International Biodeterioration and Biodegradation* 45: 97-102.

Messmer, T. A. (2009). Human-wildlife conflicts: emerging challenges and opportunities. *Human-Wildlife Conflicts* 3: 10-17.

Mitchell, B. (1989). *Geography and resource analysis*. John Wiley and Sons, New York.

Mitchell, B., (2002). *Resource and Environmental Management*. Bruce Mitchell, 2nd ed.

Monaco A, Carnevali, L., and Toso, S. (2010) *Linee guida per la gestione del cinghiale (Sus Scrofa) nelle aree protette.* 2a edizione. Quaderni Conservazione della natura, 34. Ministero ambiente-I.S.P.R.A.

Pedone P., Mattioli S. and Mattioli L., 1995. Body size and growth patterns in wild boars of Tuscany, Central Italy. *Ibex J. M. E.*, 3:66-68.

Peterson, M. N., Birckhead, J. L., Leong, K., Peterson, and M. J., and Peterson, T. R. (2010). Rearticulating the myth of human-wildlife conflict. *Conservation Letters* 3: 74-82.

Riley, S.J. and Decker, D.J. (2000). Wildlife stakeholder acceptance capacity for cougars in Montana. *Wildlife Society Bulletin* 28: 931–939.

Riley, S. J., Decker, D. J., Carpenter, L. H., Organ, J. F., Siemer, W. F., Mattfeld, G. F. and Parsons, G. (2002). The Essence of Wildlife Management. *Wildlife Society Bullettin* 30(2): 585-593.

Rosell, C., Navàs, F, Romero, S., de Dalmases, I., Sforzi, A., and Tonini L. (2011) *Wild Boar in mediterranean protected areas: managing the conflicts*. XXXth IUGB Congress (International Union of Game Biologists) and Perdix XIII.

Schaefer, D.R. and Dillman, D.A. (1998) Development of a standard e-mail methodology. *Public Opinion Quarterly* 62: 378-397

Sheskin, I. M., (1985). *Survey research for geographers*. Association of American Geographers, Washington, D.C., USA.

Siemer WF, Lauber TB, Chase LC, Decker DJ, McPeake RJ, and Jacobson CA (2004) Deer/elkmanagement actions in suburban environments: what will stakeholders accept? In: Shaw WW, Harris LK, VanDruff L (eds) *Proceedings of the 4th*

International Symposium on Urban Wildlife Conservation. May 1–5, 1999, Tucson, Arizona.

Sillero-Zubiri, C., and Laurenson. M. K. (2001). Interactions between carnivores and local communities: conflict or co-existence? (pp 282–312). IN: Gittleman, J.L., Funk, S. M., Macdonald, D.W. and Wayne, R.K. (Editors). *Carnivore conservation*. Cambridge University Press, Cambridge, United Kingdom

Svensson, E. (2000). Comparision of the quality of assessment using continuous and discrete ordinal rating scales. *Biometrical Journal* 42; 417-434.

Treves, A., Wallace, R.B., Naughton-Treves, L., and Morales, A. (2006). Co-managing human-wildlife conflicts: a review. *Human Dimension of Wildlife* 11: 383-396.

Treves, A., R. B. Wallace, and S. White. 2009. Participatory planning of interventions to mitigate human-wildlife conflicts. *Conservation Biology* 23:1577–1587.

The Nature Conservancy (TNC) (2003). *The five-s framework for site conservation: a practitioner's handbook for site conservation planning and measuring conservation success*. TNC, Arlington, Virginia.

West, P., Igoe, J. and Brockington, D. (2006). Parks and Peoples: The Social Impact of Protected Areas. *Annual Review of Anthropology* 35: 251-277

West, P., and Brockington, D. (2006). An Anthropological perspective on some unexpected consequences of protected areas. *Conservation Biology* 20; 609-616.

Wilson, R.S. (2008). Balancing emotion and cognition: a case for decision aiding in conservation efforts. *Conservation Biology* 22(6): 1452-1460.

World Wildlife Fund (WWF) (2007). *WWF standards of conservation project and program management.* WWF, Gland, Switzerland.

Woodroffe, R., Thirgood S. and Rabinowitz, A. (2005). The future of coexistence: resolving human-wildlife conflicts in a changing world. *In People and Wildlife: Conflict or coexistence?* Cambridge University Press, Cambridge, UK.

Appendix I: the questionnaire used in Circeo National Park

The Wild boar in Circeo National Park

Part A: The first few questions ask about your attitudes toward wild boar. Please cross the response that best describes your opinion.

1. **Do you think that wild boar occur in Parco Nazionale del Circeo?**

   1 a) Yes ❑ 2 b) No ❑ 3 c) Not sure ❑

2. **Which of the following best describes your opinion toward wild boar?**

   1 a) Strongly dislike ❑ 2 b) Dislike ❑ 3 c) Neither ❑

   4 d) Like ❑ 5 e) Strongly like ❑

3. **Please, make a X along this line to express your feelings toward wild boar?**

   |----------|

   Strongly negative Strongly positive

4. **Your relationship with wild boar can be perceived along a continuum of conflict and coexistence. Please mark an X along this continuum to represent your view.**

   |----------|

   Conflict Coexistence

To continue, we are going to list a series of statements. Please choose the response that best describes your opinion according to the following scale: 1= Strongly disagree; 2= Disagree; 3= Neither disagree or agree; 4= Agree; 5= Strongly agree.

	Strongly disagree	Disagree	Neither disagree or agree	Agree	Strongly agree
5. It is important to maintain wild boar populations so that future generations can enjoy them	1	2	3	4	5
6. Whether or not I see a wild boar, it is important to me that they exist in the park	1	2	3	4	5
7. There are more benefits to having wild boar in the park than disadvantages	1	2	3	4	5
8. Wild boar should be totally protected	1	2	3	4	5
9. Wild boar cause abundant damages to agricultural crops	1	2	3	4	5
10. Wild boar cause abundant damages to residential gardens	1	2	3	4	5
11. Wild boar cause abundant damages to forests;	1	2	3	4	5
12. I would be afraid to hike in the woods if wild boar were present	1	2	3	4	5

13. How dangerous is it to you a wild boar?

|----------|

Extremely dangerous Not dangerous

14. How likely, if at all, do you believe you will be attacked if you meet a wild boar?

|----------|

Strongly unlikely Strongly likely

15. If you are afraid of wild boar, what is your primary reason for this fear?

_____

_____

Part B: The next few questions ask you about your general knowledge of the wild boar. Please answer with the response that best represent your opinion.

1. **How many wild boar do you believe currently exist in Circeo National Park?**

   Number_____wild boar.

2. **The current number of wild boar in the park is:**

   1 a) Too few ❑ 2 b) just right ❑ 3 c) too many ❑

3. **Do you believe wild boar numbers in the park are:**

   1 a) Decreasing ❑ 2 b) Stable ❑ 3 c) Increasing ❑

4. **Were wild boar released in the park area and/or in the neighborhood of it?**

   1 a) Yes ❑ 2 b) No❑ 3c) Not sure❑

5. **Of the following species that cause damages to the agricultural industry (crop, livestock, beehive, fishes) which causes the most damages? (Circle one answer)**

1 a) Wolf ❑ 2 b) Bear ❑ 3 c) Wild boar ❑

3 d) Feral dog ❑ 4 e) Cormorant ❑ 5 f) Nutria ❑

Part C: These few questions ask about your feelings toward various management practices and your behaviour toward wild boar. Please put a X in the response that best describes your opinion.

1. **Do you think that wild boar damages to cultivation in the territory of the park are?**

1 a) Decreasing ❑ 2 b) Stable ❑ 3 c) Increasing ❑

4 d) Not sure❑

2. **There currently exists a compensation system for wildlife damages caused to landowner how have agricultural crop inside the Parco Nazionale del Circeo:**

1 a) Yes ❑ 2 b) No❑ 3 c) Not sure ❑

Wild boar populations can be managed to address a variety of human concerns. What priority do you believe park agencies should place on addressing the following considerations in the park area? Minimizing…

	Very low	Low	Medium	High	Very high
3. Wild boar-vehicle collisions	1	2	3	4	5
4. Damage to agricultural crops	1	2	3	4	5
5. Damage to residential gardens	1	2	3	4	5
6. Time to get compensation	1	2	3	4	5

How do you feel about the following potential management options for wild boar in Circeo National Park. Please choose the response that best describes your opinion according to the following scale: 1= Strongly disagree; 2= Disagree; 3= Neither disagree or agree; 4= Agree; 5= Strongly agree

	Strongly disagree	Disagree	Neither disagree or agree	Agree	Strongly agree
7. Increase the compensation for damages	1	2	3	4	5
8. Capture and release of animals into other areas	1	2	3	4	5
9. Selective kill inside the park	1	2	3	4	5
10. Providing opportunities to observe wild boar	1	2	3	4	5

11. Considering interactions between wild boar and people, would you like the wild boar population in the park to be:

1 a) Decrease significantly ❑ 2 b) Decrease slightly ❑

3 c) Remain at present level ❑ 4 d) Increase slightly ❑

5 e) Increase significantly

Part D: Your experience, if any, with wild boar

1. Have you ever seen a live wild boar in the wild?

1 a) Yes ❑ 2 b) No ❑

2. Have you ever experienced damages caused by wild boar?

1 a) Yes ❑ 2 b) No ❑

3. If yes, what kind?_____

4. We would like to ask you first about you perception of the likelihood of an event?

a) Wild boar-vehicle collisions

|----------|

0% 100%

Not likely Totally likely

b) Wild boar damaging agricultural crop

|----------|

0% 100%

Not likely Totally likely

c) Wild boar damaging gardens

|----------|

0% 100%

Not likely Totally likely

d) Wild boar injuring people

|----------|

0% 100%

Not likely Totally likely

5. Now, I want you to think about your willingness to accept the event.

a) Wild boar-vehicle collisions

|----------|

0% 100%

Not likely Totally likely

b) Wild boar damaging agricultural crop

|----------|

0% 100%

Not likely Totally likely

c) Wild boar damaging gardens

|----------|

0%

0% 100%

Not likely Totally likely

d) Wild boar injuring people

|----------|

0% 100%

Not likely Totally likely

Of the following organizations that could offer you information about wild boar, what, if anything, would you believe?

	Nothing 0%	A little 25%	About half 50%	Most 75%	All 100%
6. National Park of Circeo					
7. Corpo Forestale dello Stato					
8. Lazio Region					
9. Province					
10. Municipal					
11. Farmer association					
12. Hunters association					
13. Legambiente					
14. WWF					

15. How important is it for you to be informed about the situation of the wild boar in the park?

a) Not important at all ❑ b) Not important ❑ c) Neutral ❑

d) Important ❑ e) Extremely important ❑

Part E: And lastly a little about you:*

* The questionnaire is completely anonymous and this information is used only to check the nature of our sample to the population. The results are elaborate in a complex way, in a way that it is not possible to interfere with the singular cases.

1. **Gender:** a) Female ❑ b) Male ❑

2. **Place where you live:**

_____

3. **When were you born? :**

_____

4. **Are you a hunter?**

a) Yes ❑ _____ (specify the last year you went) b) No ❑

c) In the past ❑

5. **Do you hunt wild boar?**

a) Yes ❑ _____ (specify the last year you went) b) No ❑

6. **Do you have agricultural land inside or near the protected area?**

a) Yes ❑ b) No ❑

7. **Are you part of a farmer association or do you know one?**

If yes, which_____

8. **Do you protect your agricultural land from wild boar?** a) Yes ❑ b) No ❑

If yes, how_____

9. The prevention method you chose to avoid wild boar damages work efficiently.

1 a) Strongly disagree ❑ 2 b) Disagree ❑ 3 c) Neither ❑

4 d) Agree ❑ 5 e) Strongly agree ❑

10. I would be willing to try preventive measures.

1 a) Strongly reluctant ❑ 2 b) Reluctant ❑ 3 c) Neither ❑

4 d) willing ❑ 5 e) Strongly willing ❑

11. The current subsides procedures are working well.

1 a) Strongly disagree ❑ 2 b) Disagree ❑ 3 c) Neither ❑

4 d) Agree ❑ 5 e) Strongly agree ❑

12. How could the subsidies procedure be improved?

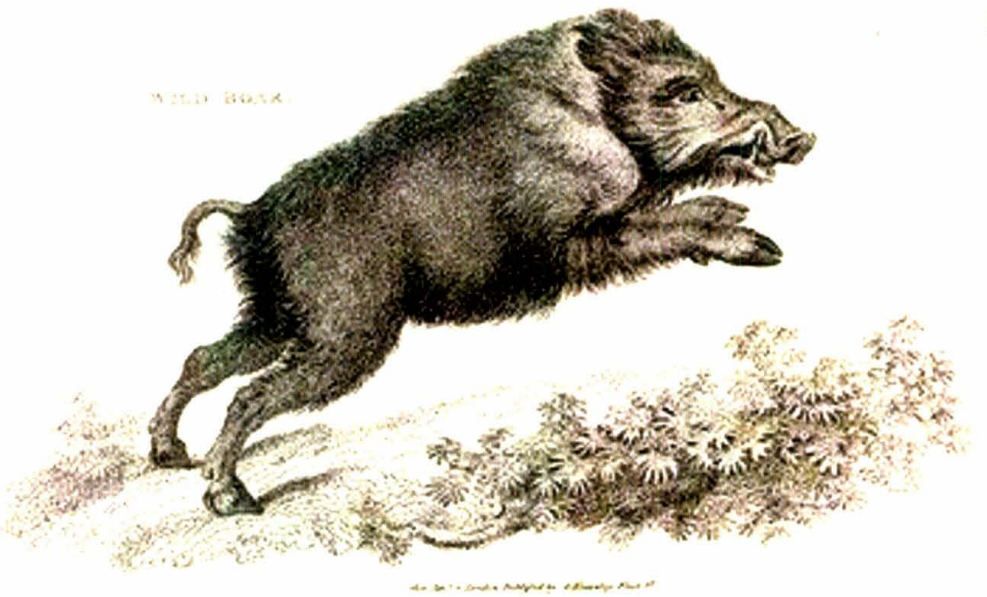
_____

_____

Thank you for your cooperation. If you have other comments on this subject or with respect of the questionnaire, please write them here.

Appendix II: the questionnaire used in the Regional Nature Reserve of Nazzano-Tevere-Farfa

The Wild boar in the Regional Nature Reserve of Nazzano-Tevere-Farfa



Part A: The first few questions ask about your attitudes toward wild boar. Please cross the response that best describes your opinion.

1. **In your opinion, for what reason has been created the Regional Nature Reserve Nazzano Tevere-Farfa?**_____

_____

2. **Which of the following best describes your opinion toward wild boar?**

a) Strongly dislike ❑ b) Dislike ❑ c) Neither ❑

d) Like ❑ e) Strongly like ❑

3. **Principally, wild boar is for you: (Cross only one answer)**

a) Game species ❑ b) Pest species ❑ c) Local species ❑

d) Non local species ❑ e) Beautiful species ❑ f) Nothing ❑

g) Other_____

4. **Please, make an X along this line to express your feelings toward wild boar?**

|----------|----------|----------|----------|

Strongly negative Strongly positive

5. **Your relationship with wild boar can be perceived along a continuum of conflict and coexistence. Please mark an X along this continuum to represent your view.**

|----------|----------|----------|----------|

Conflict Coexistence

To continue, we are going to list a series of statements. Please choose the response that best describes your opinion according to the following scale: 1= Strongly disagree; 2= Disagree; 3= Neither disagree or agree; 4= Agree; 5= Strongly agree.

	Strongly disagree	Disagree	Neither disagree or agree	Agree	Strongly agree
6. It is important to maintain wild boar populations so that future generations can enjoy them	1	2	3	4	5
7. Whether or not I see a wild boar, it is important to me that they exist in the Nature reserve	1	2	3	4	5
8. There are more benefits to having wild boar in the park than disadvantages	1	2	3	4	5
9. Wild boar should be totally protected	1	2	3	4	5
10. Wild boar cause abundant damages to agricultural crops	1	2	3	4	5
11. Wild boar cause abundant damages to residential gardens	1	2	3	4	5

	Strongly disagree	Disagree	Neither disagree or agree	Agree	Strongly agree
12. Wild boar cause abundant damages to aquatic birds	1	2	3	4	5
13. In the area where there are continuous damages, it should be possible to kill selective wild boar	1	2	3	4	5
14. Outside the protected area it should be allowed to hunt wild boar all year round	1	2	3	4	5
15. I would be afraid to hike in the woods if wild boar were present	1	2	3	4	5

16. If you are afraid of wild boar, what is your primary reason for this fear?

a) Car accident ❑ b) Dangerous for people ❑ c) Attack people ❑

d) Scary looking ❑ e) Fear of animals ❑

f) Not afraid ❑ g) Other:_____

Part B: The next few questions ask you about your general knowledge of the wild boar. Please answer with the response that best represent your opinion.

1. **How many wild boar do you believe currently exist in the Regional Nature Reserve Nazzano Tevere Farfa?**

   Number_____wild boar.

2. **Do you believe wild boar numbers in the nature reserve are:**

   a) Decreasing ❑ b) Stable ❑ c) Increasing ❑

3. **The current number of wild boar in the nature reserve is:**

   a) Too few ❑ b) Just right ❑ c) Too many ❑

4. **Were wild boar released in the park area?**

   a) Yes ❑ b) No❑ ❑c) Not in the park ❑

   d) Not sure ❑

5. **If yes, who in your opinion did release wild boar?**

   a) Park managers ❑ b) Park agencies ❑ c) Hunters ❑

   d) Environmentalists ❑ e) Others_____

Part C: Your experience, if any, with wild boar

1. **Of the following species, which causes the most damage in Lazio Region? (Cross only one answer)**

   a) Wolf ❑ b) Bear ❑ c) Wild boar ❑

   d) Feral dog ❑ e) Cormorant ❑ f) Nutria ❑

   g) Others_____

2. **Have you ever seen a live wild boar in the wild?** a) Yes ❑ b) No ❑

   If yes, roughly, how many time did you see it last year?_____

3. **Have you ever experienced damages caused by wild boar?**

   a) Yes ❑ b) No❑

   If yes, of which kind? _____

4. **How do you feel about the damages above?**

   |----------|----------|----------|----------|

   No tolerance Complete Acceptance

5. **Are wild boar damages in Nazzano-Tevere Farfa area:**

   a) Decreasing ❑ b) Stable ❑ c) Increasing ❑ d) Not sure❑

6. **How tolerant, if at all, are you of these damages?**

   |----------|----------|----------|----------|

   No tolerance Complete Acceptance

7. **Are you aware of the existence of a compensation system for wildlife damages inside or around the Regional Nature Reserve Nazzano Tevere Farfa:**

a) Yes ❑ b) Yes, but I don't know how it works ❑ c) No ❑

8. **People that do not want to use preventive systems provided by the protected area should receive anyways compensation for wild boar damages?**

a) Strongly disagree ❑ b) Disagree ❑ c) Neither ❑

d) Agree ❑ e) Strongly agree ❑

9. **Farmers should have insurance for protection against wild boar damages.**

a) Strongly disagree ❑ b) Disagree ❑ c) Neither ❑

d) Agree ❑ e) Strongly agree ❑

10. **Who of the following should pay for the insurance:**

a) Farmer ❑ b) Hunter ❑ c) State ❑ d) Municipality ❑

e) Regional Park Agency ❑ f) Nature Reserve Nazzano-Tevere Farfa ❑

g) European Community ❑ h) Don't know ❑

Part D: These few questions ask about your feelings toward various management practices and your behaviour toward wild boar. Please give the response that best describes your opinion.

How do you feel about the following potential management options for wild boar in the Regional Nature Reserve Nazzano-Tevere Farfa. Please choose the response that best describes your opinion according to the following scale: 1= Strongly disagree; 2= Disagree; 3= Neither disagree or agree; 4= Agree; 5= Strongly agree

	Strongly disagree	Disagree	Neither disagree or agree	Agree	Strongly agree
1. Supply preventive measures	1	2	3	4	5
2. Increase the compensation for damages	1	2	3	4	5
3. Capture and release of animals into other areas	1	2	3	4	5
4. Selective kill inside the park	1	2	3	4	5
5. Providing more opportunities to observe wild boar	1	2	3	4	5

6. **Hunter should be involved in wild boar management inside the Regional Nature Reserve Nazzano-Tevere Farfa.**

a) Strongly disagree ❑ b) Disagree ❑ c) Neither ❑

d) Agree ❑ e) Strongly agree ❑

7. **If involved in wild boar management, what should hunters do?**

a) Cull wild boar inside the reserve ❑

b) Help farmer preventing damages❑

c) Help managers in the decision-making process ❑

d) Other_____

If the protected area would have only 100 €, how should it distribute the money to address the following considerations in the park area? The money used for an option, should be subtracted from the total amount of 100 € and can not be used anymore.

	0 €	25 €	50 €	75 €	100 €
8. Minimizing wild boar-vehicle collisions					
9. Minimizing damage to agricultural crops					
10. Minimizing damage to residential gardens					
11. Minimizing damages to the aquatic birds					
12. Facilitate the concession compensation					

13. **Of the following preventive measures that could be tried by the park agency, which do you feel should be done? Divide the listed preventive measures in three equal categories: 1=most important, 2= medium important, 3= less important.**

Fences with metallic poles and nets _____

Electric net_____

Distress call (e.g. field gun)_____

Olfactory repellents_____

Creation of artificial feeding sides_____

Cages, fences for selective capture _____

Traps for selective capture_____

Preventive measure technique support_____

Public awareness campaign_____

Of the following organizations that could offer you information about wild boar, what, if anything, would you believe?

	Nothing 0%	Little 25%	Half 50%	Most 75%	All 100%
14. Regional Nature Reserve Nazzano Tevere Farfa					
15. Lazio Region					
16. Province					
17. Municipal					
18. Farmer association					
19. Hunters association					
20. Legambiente					
21. WWF					

22. How important is it for you to be informed about the situation of the wild boar in the park/reserve?

a) Not important at all ❑ b) Not important ❑ c) Neutral ❑

d) Important ❑ e) Extremely important ❑

23. If it would be possible, would you like to be involved in the processing of wild boar management option in the park?

a) No, I'm not interested ❑ b) No, is not my business ❑

c) Yes, but only as audience ❑ d) Yes, as a participant in the process ❑

Part E: And lastly a little about you:*

* The questionnaire is completely anonymous and this information is used only to check the nature of our sample to the population. The results are elaborate in a complex way, in a way that it is not possible to interfere with the singular cases.

1. Gender: a) Female ❑ b) Male ❑

2. Place of residence:_____

3. Age : a) from 18-39 ❑ b) from 40-64 ❑ c) over 65 ❑

4. Are you a hunter? (If not go to question 9)

a) Yes (specific the last year you went) _____❑ b) No ❑

5. Do you hunt wild boar outside the protected area?

a) Yes ❑ _____ b) No ❑

6. Is this a good area in numbers for hunting wild boar?

a) Yes ❑ b) No ❑

7. How many non-residents hunt wild boar in the area?

a) Too few ❑ b) About right ❑ c) Too many ❑

8. Would you like to be involved in culling wild boar if taken into account by the park?

a) Yes ❑ b) No ❑ c) Not sure ❑

9. Do you farm land inside or near the protected area? (if not, thank you for completing this questionnaire).

a) Yes (specific how big) _____ ❑ b) No ❑

10. Are you part of a farmer association?

If yes, which_____

11. Do you protect your agricultural land from wild boar? a) Yes ❑ b) No ❑

If yes, how_____

12. The preventative measure currently used to avoid wild boar damages works efficiently.

1 a) Strongly disagree ❑ 2 b) Disagree ❑ 3 c) Neither ❑

4 d) Agree ❑…….. 5 e) Strongly agree ❑

13. I would be willing to try preventive measures if provided by the park.

1 a) Strongly reluctant ❑ 2 b) Reluctant ❑ 3 c) Neither ❑

4 d) Willing ❑ 5 e) Strongly willing ❑

14. The current compensation procedures are working well.

1 a) Strongly disagree ❑ 2 b) Disagree ❑ 3 c) Neither ❑

4 d) Agree ❑ 5 e) Strongly agree ❑

15. How could the compensation procedure be improved?

1 a) Reduce time to receive compensation ❑

2 b) Improving type of damage survey ❑

3 c) Make the regulation easier and accessible ❑

4 d) Provide more information about compensation ❑

5 e) Other_____

16. Are you willing to tolerate a certain amount of damages to your cultivation to have wild boar population in the park?

a) Yes ❑

b) Not at all ❑

c) Depends from the amount of damages ❑

d) Depends from the amount of reimbursement ❑

e) Depends from the type of crop damaged ❑

Thank you for your cooperation. If you have other comments on this subject or with respect of the questionnaire, please write them here.